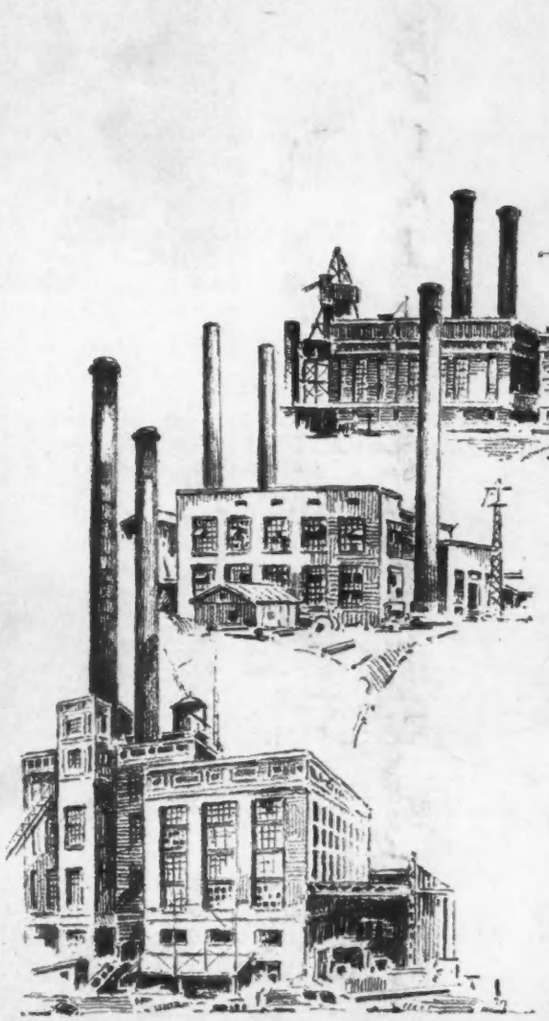
APR 28 1924

Founded March 1, 1874—Fifty Years of Service

Electrical World

McGraw-Hill Company, Inc. *April 26, 1924* Twenty-five Cents Per Copy

ELESCO

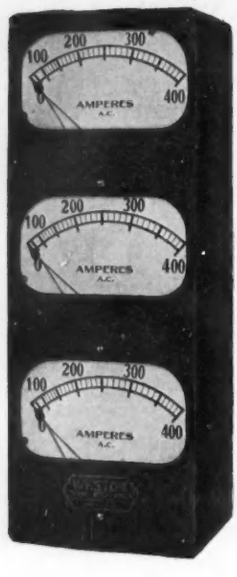


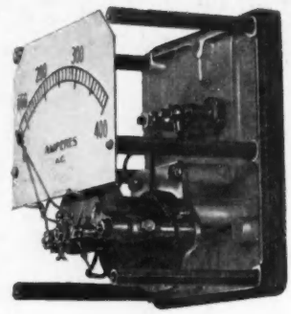
THE generation of superheated steam and its proper application demand engineering and experience second to none in the power field, to cope with the more exhaustive studies of boiler design, methods of combustion and heat balance which is demanded by the higher temperatures and higher pressures.

There is an ever increasing number of boiler manufacturers, consulting engineers and steam power plant engineers in the industrial and central station fields, who come to The Superheater Company, 17 East 42nd Street, New York, for advice and designs in solving their problems.

SUPERHEATERS

82,000,000 HORSEPOWER EQUIPPED IN LOCOMOTIVE, STATIONARY AND MARINE SERVICE





Met at last-the two needs of the switchboard engineer

Increasing power demands call for large switchboard apparatus of higher rated capacity. On the other hand, rising real estate values make it important to conserve every inch of switchboard space.

Both needs are simultaneously met by the new Weston rectangular instruments. With these instruments, space requirements are radically reduced—in some cases by nearly one-half. Thus they allow more room for other devices while they cut down the space occupied by instruments. To the designer who faces immediate problems concerning densely settled communities or to the designer who is building with an eye to future needs, Weston instruments offer a real opportunity for better and less expensive switchboards.

Here is a group of new instruments made by America's pioneer instrument maker—whose instruments have earned a reputation with engineers the world over as the best obtainable. This new size, 5¾ in. wide, 6 in. high, and 4¼ in. deep, is one that has received commendation everywhere. Mounting is standardized. Instant readings are assured by wide scale openings.

These new instruments have every advantage that is possible and are neat and compact. The new group is complete. It includes Alternating Current Ammeters, Voltmeters, Wattmeters, Frequency Meters, Power Factor Meters and Triplex Ammeters,, and Direct Current Voltmeters and Ammeters.

These instruments are of vital importance to all engineers and switchboard designers.

Full information is contained in Bulletin 1504A. Write for your copy today.

Weston Electrical Instrument Co., 13 Weston Ave., Newark, N. J.

Branches in Principal Cities Throughout the World

Electrical Indicating Instrument Authorities Since 1888

WESTON

STANDARD - The World Over

Electrical World

The consolidation of Electrical World, Electrical Engineer and American Electrician

Published by McGraw-Hill Company, Inc.

W. H. ONKEN, JR. Editor — HAROLD V. BOZELL Editor

Volume 83 — New York, Saturday, April 26, 1924 — *Number* 17

Commercial Departments Need Vigorous Reawakening

FOR almost a decade the commercial departments of electric light and power companies have been living in a state verging upon decrepitude. Compelled during the war to cease functioning, they have not returned to normal or manifested the zeal and enthusiasm they once possessed for making converts to electricity. The commercial departments have, in short, let down. Business came so easily that they followed the line of least resistance and now it is a hard job to get back again.

Managers have been chiefly to blame for this condition. Money was for a time difficult to obtain and the stations were carrying all the load possible. During that period the job of the commercial department was to keep load off the system, and many commercial men were engaged in selling securities. However laudable that purpose may be, the function of an electric light and power company is to sell electrical energy and to render a public service. That is its primary duty, and that job it must do better than it has been doing if the industry is to continue to boast of its initiative, enterprise and enthusiasm. The automobile industry, which is only about half as old as the electric light and power industry, claims that there are fifteen million automobiles in use today. The electrical industry can show only thirteen million meters, notwithstanding that electric service is considerably cheaper than auto service and the first cost is less. If people can be induced to buy and use automobiles, they certainly can be induced to use electricity. With the commercial departments of electric light and power companies on the job—and many of them are right on their toes—the records made last year in Brooklyn, Newark, Philadelphia and a few other centers will be duplicated all over the country, and the whole industry will enjoy a prosperity never before equaled.

O. D. Young's Efforts for World Peace

THE report of the committee of experts which has been investigating Germany's capacity to make reparation payments and devising measures to render such payments possible has been universally commended. It was no easy task for any committee, and particularly for one limited in its scope as the Dawes committee was, to work out a plan which would be acceptable to the Allies and Germany alike. But Dawes and Young were equal to the job and as practical business men succeeded in doing what was seemingly impossible.

What the final acceptance of the report will mean to war-torn Europe and the rest of the world is obvious. Already Germany is imbued with fresh hope and the dawn of a new era has risen over Europe. Both the merit and the acceptability of the report have thus been made manifest. Men who have been groping about have now been shown the way. It is futile to imagine that conditions in Europe can long continue as they are or that even America can become entirely normal unless the question of reparations is settled amicably and satisfactorily. It is vain, also, to look for anything but declining markets at home and abroad while Europe remains dejected and discordant. It needed a trustworthy and unbiased investigation to establish the truth and then plain, unequivocal words to express it.

Needless to say, the electrical industry takes unconcealed satisfaction in the contribution which one of its outstanding men, O. D. Young, has thus made to the world and incidentally to the electrical industry itself. Less inclined to the limelight but no less fitted for the task than the picturesque General Dawes, one can be certain that to the calm and judicial mind of O. D. Young is due much of the persuasive effectiveness and sound reasoning of the report. As Americans we are proud to have public-spirited men able and willing to engage in a work of such magnitude and vital importance, and as an industry we are especially honored by the great part O. D. Young has played in it.

A Call to Conclave—the N. E. L. A. Forty-seventh Annual Convention

TO THOSE who know how to capitalize on the opportunities offered at that great annual institution, the National Electric Light Association convention, exhortation to attend is superfluous—they make arrangements to come as soon as they know the date and place. To others who may have been lost among the glories of earlier assemblages, who may have been so confused by the variety of opportunities that they could grasp few of them, words of encouragement to come and improve their opportunities should be given. And to those who in the past may have been so short-sighted, so lacking in imagination, so overcome by the apparent importance of the daily task at home, that they have not even come to see what the convention looked like, convincing argument should be made to show them what they are allowing to slip by.

The National Electric Light Association annual convention has grown, by merit, to be the outstanding industry event of the year. It is natural and it is fitting that as the industry grows, as its problems become more complex, its conventions should likewise become more complex, more crowded with questions to be answered, more filled with worth-while meetings, more enriched by constructive and inspiring addresses and discussions.

The forty-seventh annual convention, with an accompanying exhibit, is to be held at Atlantic City dur-

ing the week of May 19. It has been two years since there has been an exhibit. It is predicted that the next convention will be on the Pacific Coast, and this will naturally make it more difficult for many of those in the eastern section of the country to attend. This past year has been productive of many advances in many parts of the country. The program this year is full of addresses of high caliber; the sections have vied with each other and even with the National Association itself to build programs of outstanding merit based on questions of primary interest. This convention promises to be worthy of an industry strong, and growing stronger, in vitality and accomplishment.

The call is issued to come to the convention. He who heeds not must bear the consequences—he it will be who will suffer most and lose most by neglecting so splendid a chance to mix with his fellows and gain both knowledge and inspiration.

Design Economics of Standby Steam Stations

EXPERIENCE with most water powers has shown that standby steam stations are necessary and economical to carry peak loads in addition to the duty they perform in insuring reliability of service. As a result installed steam capacity up to 50 per cent of the total of the entire system rating is found on many large systems. There is, besides, a growing program of development of standby or auxiliary steam stations because of the expense connected with the construction of storage systems for water powers.

There are several features connected with the design of these stations which are interesting as a new development. As a rule, they operate only a part of the year and only under system peak-load conditions. It has therefore been found advisable to reduce investment to a minimum and to install equipment which does not call for the highly skilled operating force or operating methods used in base-load steam stations. Instances are available where stations of 40,000 kva. and 60,000 kva. capacity have been installed for about seventy dollars per kva.

The installation cost just mentioned has been obtained by leaving out of consideration many costly accessory equipments in both mechanical and electrical portions of the plant. The attempt is then made to obtain as great simplicity, reliability and high efficiency as possible under the particular operating conditions. Coal-weighing devices in the boiler room, forced draft, pumps for condenser circulation, some of the feed-water, draft and combustion meters and accessories are among the elements which may be eliminated on the mechanical side.

But probably the greatest savings result from economies introduced in the electrical side of the plant by adapting the unit installation plan. In some cases the generators are connected directly through oil breakers and disconnecting switches to three-phase transformers and thence to the high-tension lines. The use of bushing-type instrument transformers and the elimination of low-tension buses tend to reduce investments very considerably, and still further reductions are obtained by the elimination of many of the rooms, control galleries and partitions found in the usual steam stations. Operating experiences with the newer simplified stations have been very favorable, but a further trial period is necessary to determine the economic limit to which installation economies can be carried without impairing efficiency in operation or service reliability.

What Holds Back the Electric Trucks?

SEVERAL months ago it was announced that a resolution had been passed by the Electric Transportation Bureau of the National Electric Light Association to appoint a committee under the leadership of some prominent central-station executive to make a serious and thorough investigation into the forces holding back the electric vehicle. The resolution stated that prejudice of central-station executives and indifference on their part to the value of the vehicle load, added to destructive competition among truck and battery manufacturers, were the chief obstacles to progress, and the committee was to dig out the facts and bring the issue squarely before the industry, just as the merchandising policy committee of the Association of Edison Illuminating Companies has done in that field, under the chairmanship of John F. Gilchrist. The truck manufacturers were seemingly ready to lend frank aid in order that the situation might be clearly pictured to the industry.

Apparently nothing has been done to carry out this purpose. Meanwhile individual cases proving the superiority of the electric truck in its own field continue to pile up, but receive scant attention. The size of the load continues to increase steadily in cities where serious effort has been made to establish electric truck transportation. Is it not time for all electrical men to revise their estimates of the worth of the electric truck and bring them up to date? Where is the Gilchrist who will show us frankly what holds the vehicle back and marshal industry sentiment behind the facts as they are today?

Lighting and the Pupil of the Eye

THE pupil of the eye has a greater effect upon the efficiency of the worker than is generally realized. The brightness of the retinal image of that which one is looking at is the fundamental factor in vision, and this brightness is proportional to the area of the pupil, other conditions remaining constant. It has been found that the pupil varies in diameter from about 2 mm. to 8 mm., depending upon the brightness to which the eye is adapted or exposed. It has also been found that the ability of the eye to see fine detail is approximately constant for a range of pupillary diameter from 2.5 mm. to 5.5 mm. It is generally known that the pupil contracts very much when the eye is exposed to glaring light sources, but the practical effect of this contraction is too generally overlooked.

Let it be assumed that a workman has 5 foot-candles upon his work, but that the lighting is so glaring that his pupils are contracted to a diameter of 3 mm. For the sake of comparison let it be further assumed that a second workman also has 5 foot-candles upon his work, but that the lighting units are of proper design and are hung well out of his direct line of vision. In this case the absence of glare, it will be assumed, causes his pupils to expand to 4½ mm. The brightness of the retinal image being proportional to the square of the diameter of the pupil, the retinal images of the second

workman will be twice as bright as those of the first workman. Even though the intensity of illumination at the work is exactly the same in the two cases, the second workman is really enjoying the advantage of twice as much light. His visual doorway is open a hundred per cent more than that of the first workman exposed to glare. With the present knowledge of the increase in production resulting from an increase in illumination intensity, this aspect of glare is of much interest. There are other beneficial results arising from elimination of glare, such as greater comfort and safety, but the one just stated is directly measurable in terms of foot-candles. If all other pleas for eliminating glare are ineffectual, certainly this one has much force.

It should be noted again that the foregoing pupillary diameters are assumed for the purpose of discussion; this phase of lighting is now being thoroughly investigated and definite values are not yet known. However, results so far obtained indicate that the values assumed are satisfactory for presenting this very effective argument for the elimination of glare.

Why Not Be Consistent In the One-Piece Quality?

JOHN WANAMAKER is credited with having planted the seed of a one-price policy in American business. It has become standard practice in retail stores today and among both wholesalers and manufacturers, in so far as staple goods are concerned. It is not yet firmly established, however, when it comes to contracts for electrical manufactured products, where the purchase is made after the comparison of bids. The same is true, of course, in various other industries. Some bids are submitted as the manufacturer's fair and honest price, some are submitted with a view to later trading; in either case they are frequently used by the buyer as a basis for trading. He plays one against the other, and under this pressure and persuasion well-calculated prices are often pulled down and profits sacrificed.

Theoretically every purchaser will admit the right of the seller to a proper profit. More than that, any thinking man will freely state that he prefers to deal with prosperous concerns and lacks confidence in any manufacturer who is not making money. The buyer, therefore, does not desire to steal away the seller's profit; rather, he doubts whether the quoted price is the bottom price, and he doubts only because his experience has proved that oftentimes these prices can be cut if he insists.

Actually there is no reason why prices should not be stiffly sustained on large contracts just as much as on goods sold over the counter. Bargaining in retail stores used to be common, too, but the evil has been stamped out. It remains now to apply the principle as rigidly to "bigger business" where there are bigger profits to be conserved. It is encouraging, therefore, to note that some of the larger companies are beginning to make a courageous effort to put an end to this very flagrant cause of what virtually amounts to unfair competition.

It will take time to overcome the mental attitude among salesmen that has bred this practice and teach them that it is an economic crime to give in on an honest price and disloyal both to employer and to customer. Naturally, the effort will be resisted no less by the purchaser, because he too has contracted this price-trading habit. But the practice can and will be stopped, because it is economically indefensible. Meanwhile, reform could be geratly facilitated by a frank undertsanding among the prominent buyers and sellers of the industry that hereafter in such transactions between them bids would be figured at rock bottom as initially submitted and accepted or rejected without seductive attempts to obtain a lower price.

Sectionalization Versus Interconnection

ON A THEORETICAL basis the greater the network obtained through the interconnection of power stations and high-tension lines, the greater the stability of the systems and the better the reliability of the service. But as a practical operating procedure there may be conditions which very greatly modify the general principle. In some cases it is reported that service reliability is impaired when operating several systems interconnected and that experience has proved that the utmost degree of sectionalization is the best practice. Even generators in the same station are not paralleled, but each operates on some unit line or section. Thus, in this type of interconnection, the interconnection switching facilities are utilized only under abnormal operating conditions.

Several things are responsible for this occasional practice of sectionalization and for these opinions, but they can be grouped for the most part under three headings—(1) regulation requirements, (2) inadequate relays, (3) inadequate or unequal factors of safety on installations and equipments, or inadequate capacity in some important link. Under regulation comes governing of steam and water units to maintain constant frequency under all load conditions and in addition voltage regulation at the different points on the system, and under certain conditions these requirements place a heavier burden on operators if systems are operated interconnected. One of the necessary provisions in any interconnection is a reliable and adequate relay system for isolating trouble, and on many systems this type of relaying has not been well enough developed to prevent impairment of service on the interconnected system should trouble arise at any point. To operate on a sectionalized basis is an easy way out of that one difficulty and obviates installing adequate relaying equipment, but such a practice is founded on unsound principles of development.

The real problem, however, in many cases lies in the third class, for it is very unsatisfactory to have a modern system using high-grade equipment tied with an antique installation with very low factors of safety as regards the equipment and very little protection on its lines. Such an interconnection introduces a hazard to the good system, and its own service reliability is reduced to that of the poorer plant.

It is encouraging to note that all of the three handicaps are closely related to one another and can be overcome. The many existing extensive interconnecting systems which are operating satisfactorily—in fact, more satisfactorily than their parts operated independently before interconnection—are proof enough that the engineers have sufficient control over conditions to make interconnections feasible. The fundamental principle that interconnection is better than sectionalization is sound, and only time and money are required for its greater application.

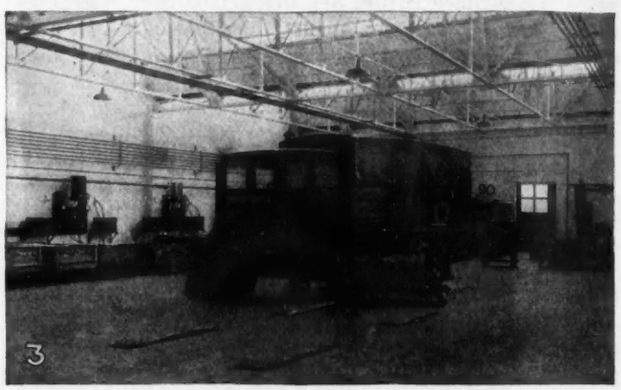
1

2

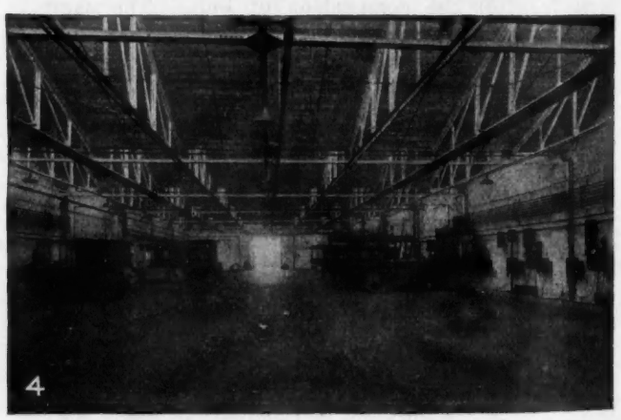
Electric Truck Service Makes Progress at Hartford

SINCE 1912 the industry has been interested in the Hartford "battery service" system of electric truck operation. On a mileage basis of billing, a gross revenue of about $10,000 a month is now received by the Electric Transportation Company, Inc., which not long since took over the commercial transportation activities of the Hartford Electric Light Company. Views of its finely appointed garage and service station are shown here. With a frontage of 120 ft. the plant has a floor area of 12,000 sq.ft., and at present seventy electric trucks are regularly charged, sixty-three of these being on the battery service system, the Transportation company owning the batteries and billing monthly for service on a rate schedule varying according to the size of the truck and the mileage operated.

In the nine months ended Jan. 31, 1924, the sixty-three trucks ran 327,676 car-miles, about 607,200 ton-miles being operated. The station purchased about 636,000 kw.-hr. at a cost of about $11,950 to render this service. The maximum demand was approximately 241 kw. and the load factor was about 40 per cent. W. M. Thayer is president of the Electric Transportation Company, Inc.

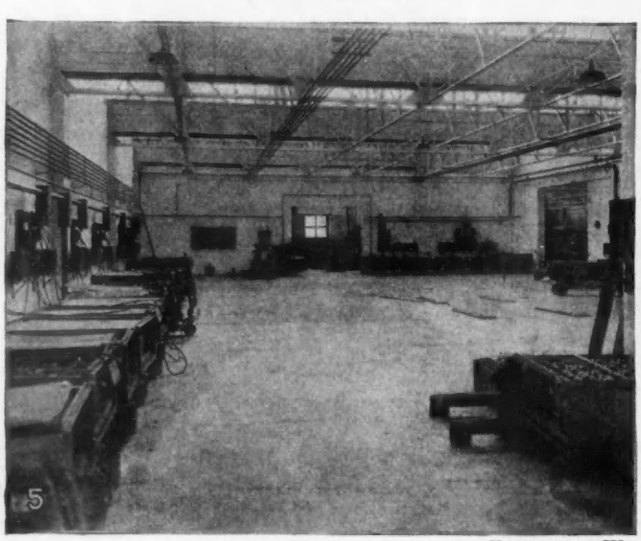


3

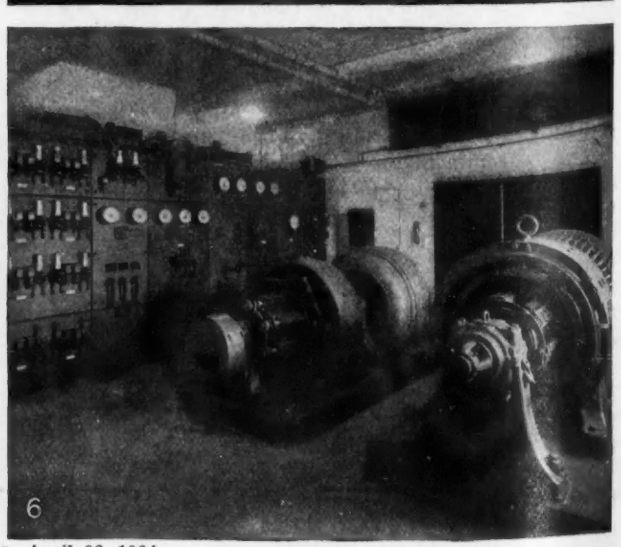


4

1. Exterior of present electric vehicle service station, which, with charging equipment, represents an investment of about $110,000.
2. Starting and lighting battery room for charging and repairs. Heavy repair work and cleaning of vehicle batteries are also done here.
3. Battery exchange room, where batteries are changed upon arrival of customers' trucks. A new battery can be inserted in about three minutes. Spare batteries are kept in this location.
4. Charging stations for electric trucks. The "night stand" is 175 ft. long by 60 ft. wide and forty-four trucks can be charged at one time.
5. Spare battery storage for use in battery exchange room.
6. Two synchronous motor-generator sets rated at 290 hp. and 350 hp. at 120 volts on the direct-current side supply charging current and help maintain a satisfactory power factor.



5



6

Effect and Prevention of Short Circuits

By Extending Isolation of Phases Beyond Generating Stations to Primary Distribution Points a Saving of Investment and Greater Reliability Will Be Gained Even on Small Interconnected Systems

By B. G. JAMIESON
Engineer of Inside Plant, Commonwealth Edison Company

IN ANY large cable system rated at 100,000 kw. or more immediate economies attained by the use of high-tension three-conductor cable and service to customers at primary-system voltage introduce liabilities only partially capable of annulment. These features cause contingent expenditures for protective apparatus and devices which it may be well to reconsider, particularly in view of their extraordinary responsibility. As systems are now designed every move toward the economy possible with parallel operation increases liabilities. This is fundamentally wrong.

Distribution systems of the isolated-phase type may be so proportioned that the fault energy possible on the system will be but a fraction instead of a multiple of the normal-power energy obtained on systems of the conventional grouped-phase type. This means relief from the problem of heavy-duty circuit-breaker development, the end of widespread system disturbances and of what is herein termed the "energy-repression charge," now duplicated at every receiving station, and, what is more important, the elimination of liabilities now only partially amenable to control.

THE ENERGY REPRESSION CHARGE

To central-station operating men whose prolonged efforts have been directed toward high standards of service and to reducing capital costs there is no necessity of amplifying or otherwise justifying the general statement that at present in large electricity supply systems costs are high, liabilities are great and disturbances due to failures are too widespread in their effects. Particularly is this so in view of the movement toward "superpower" systems and of the fact that transient conditions such as follow failure, rather than normal operating characteristics, may limit or even prohibit the development of such systems.

Engineers will readily acknowledge the inherent limitations of contemporaneous systems of protective relays, the excessive cost of heavy-duty breakers and other obvious limitations in practice, but has the inevitable consequence of development of electricity supply systems requiring this sort of apparatus been appreciated? This consequence is the "energy-repression charge," which is a real capital charge just as truly as insulation cost. The following is an analysis of its nature with a view to its elimination.

If a substation is supplied from a source of electrical energy not greater than its maximum demand, no capital expenditure is required at the substation for protection against energy in excess. If, however, a hundred substations are supplied directly from primary distributing centers and from a three-conductor cable system having a carrying capacity equal to the simultaneous demands of the substations practically the entire power available can be carried into any substation if a fault occurs there. Therefore, at each of the hundred substation terminals as well as at the primary distributing center a heavy contingent expenditure must be made for protective apparatus, particularly for heavy-duty oil breakers, relays and reactors, to deal with the excess energy resulting from system faults. This and other related contingent expenditures which may amount to an appreciable percentage of the

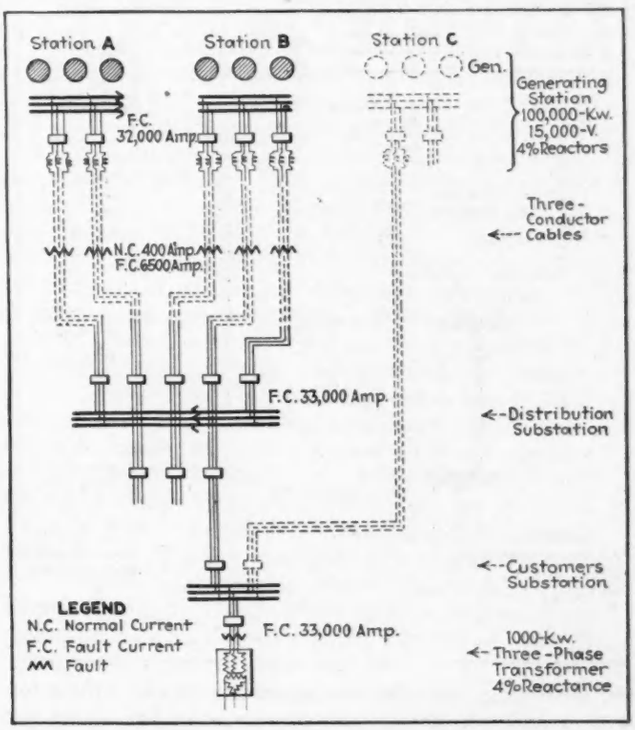


FIG. 1—WITH GROUPED PHASES FAULT ENERGY AT SUBSTATION MAY EQUAL THAT AT GENERATOR STATION

distribution system cost will be referred to in this article as an "energy-repression charge"

Prominence or Obscurity.—This energy-repression charge may be masked to a greater or less extent in a large distribution center, but it becomes very prominent at a small substation of the average consumer type. Moreover, as the system develops this charge is likely to be substantially increased by replacements or reinforcements. This is an economic waste from an engineering as well as a commercial point of view.

In this repression charge there are some constituents, such as protective apparatus, which obviously increase and others which apparently decrease the cost; actually all of these factors are debits in the grand total of expenditure. For example, consider sectionalizing of the system. While this does decrease liabilities at a given substation it very definitely increases investment in the distribution system as well as in the power sta-

tion. It is quite common practice to go half way with the scheme of sectionalizing by interconnecting the sections of system through reactors. This increases the utility of the sectionalized system to an extent, but it also very definitely lessens its utility as compared with a system freely operable in parallel. Particularly is this true with a low-power-factor system. Line reactors or other excess-energy-absorbing devices at power centers or substations are fully effective only if interconnections beyond are avoided, which shows the limited value of such agencies.

Ratio of Substation Capacity to Fault-Energy Impositions.—The exact ratio of the substation capacity to the maximum imposition of excess energy under abnormal system conditions depends upon a number of characteristics of the system; for example, its size, its mode of connection to the substation, its voltage, the extent of sectionalizing, and also the proximity of the substation with respect to the power centers, and the character of the reserve. But the devastating anomaly lies in the fact that the smallest substation may have to bear the same energy-repression charge as the largest.

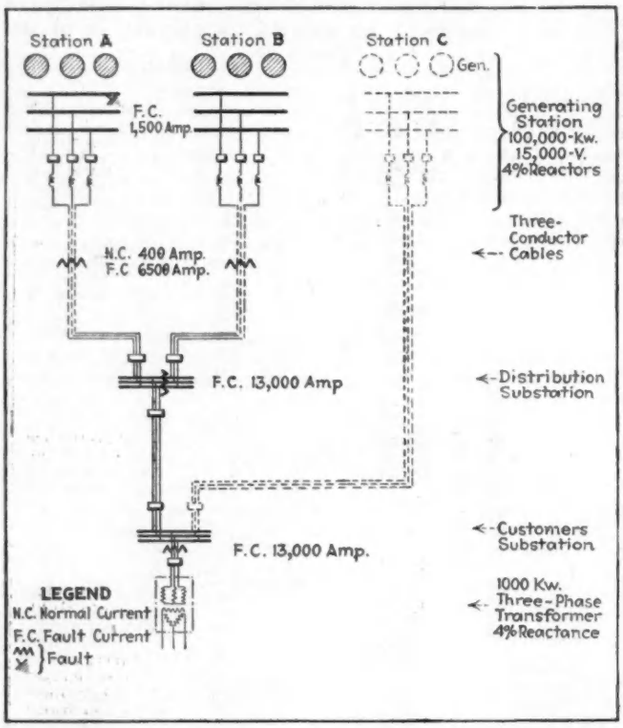


FIG. 2 (LEFT)—EFFECT OF PHASE-ISOLATED BUS AND CIRCUIT BREAKERS AT GENERATING STATIONS BUT RETAINING GROUP PHASE OUTSIDE

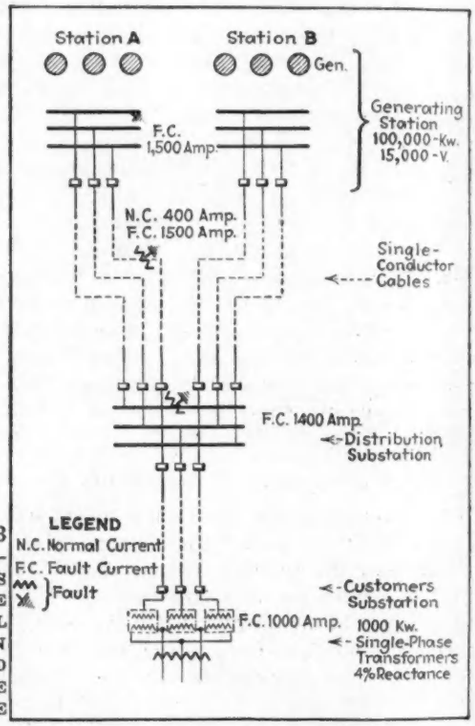


FIG. 3 (RIGHT)—FAULT CURRENTS POSSIBLE WITH FULL APPLICATION OF ISOLATED PHASE PRINCIPLE

Magnitude of Fault Energy.—In a large moderate-voltage system serving high-density municipalities as much as 1,000,000 kw. in generator rating may be required, possibly more. Under conditions of fault even with a sectionalized system protective devices may be called upon to handle five times this amount of power in kva. Obviously, though it is possible to develop apparatus to withstand such heavy duty, the risk incident to failure is so great that such misdirected development should be avoided if possible. But if the system is designed with inherent characteristics such that short circuits cannot occur on the primary system and so that those which may occur on the secondary of the system are reduced by transformer reactance to normal load values on the primary system, the liabilities and the energy-repression charge disappear. Then the cost of the system is practically all dedicated to the distribution of electricity instead of in a substantial amount to protection of the system from itself.

Abolishment of system short circuits may be accomplished by the extension of the isolated-phase system from the generating stations or principal distributing centers on through the primary cable system and substation to a point on the secondary system where the fault energy is automatically limited to the desired extent by the system impedance. Since distributing centers can be designed in a manner which renders short circuits practically impossible, this extension involves nothing further than the overcoming of some older, generally assumed limitations to the use of single-phase cable, really minor to commercial objections which will be urged because of the unfortunate standardization of three-phase cable. Single-phase transformers are a necessary part of the scheme, and fortunately their status has not been so much impaired by the cheaper substitute, the three-phase transformer.

Isolation of Cables.—The defective isolation of single-conductor cable should not be so difficult as that of three-conductor cable for the reason that no fault can originate as a phase short circuit. The experience of many American operating companies which have used both kinds of cable is probably amply sufficient to support this view of the liabilities involved, particularly when it is remembered that underground installations have not always in the past been made in a manner which minimized these liabilities.

Sheath Losses.—It is even now claimed that sheath loss in single-conductor cable may, by careful attention to bonding and sheath transposition, be reduced from 15 or 20 per cent of the I^2R losses to 1 or 2 per cent, although this precaution may not be necessary with short runs because of the relatively small loss. Careful transposition should also serve to equalize voltage unbalance between phases as effectively as on overhead lines, although no data from experience are available on this point.

Cable Voltage Limits.—The fact that single-conductor cable has a high-voltage utilization limit far above that of three-conductor cable is significant. Even the most optimistic estimates of the practical voltage limit with

three-conductor cable will not exceed 50 per cent of that practicable with single-conductor cable—this, too, without consideration of joints which may prove to be a limiting feature of three-phase cable. The excess reactance of the single-conductor cable as compared with three-conductor, although a linear function, is also a feature of value as a protective characteristic.

Cost of Cable.—The present relative cost of single-phase and three-phase cable based on the same copper cross-section and equivalent insulation is perhaps three to two, but that this is a permanent ratio is improbable. In fact, in view of the present limitations of three-conductor cable, it is a fair assumption that, based on equal reliability, either the price of three-phase cable is too low or that of single-phase too high—probably the latter, at least if the demand for it becomes comparable with that for three-conductor cable.

COMPARISON OF SYSTEMS

It will be evident that the utilization of single-phase transformers, of the isolated-phase type of distribution centers and of single-phase cable is electrically equivalent to the displacing to the consuming point of current-limiting reactance now required and installed at the primary distributing station because of the short-circuit liabilities of three-phase cable. But the isolated-phase system is a far more effective short-circuit preventive than three-conductor cable with reactors at the primary centers subject to interphase short circuit in the cable just beyond the reactors. And when it is remembered that the average inherent value of inherent transformer reactance at the consuming substation is two or three times as effective at the substation as the same value at the primary distributing center, that it is available without extra cost, and that it operates without loss, the inherent economy of such a system is apparent.

Smaller Systems.—Operators of smaller utilities may not consider phase isolation necessary, because in the past with definitely limited interconnected capacities these systems have generally proved sufficiently rugged to take care of their major liabilities, but whether this margin is sufficient when these smaller systems are interconnected with larger systems in the future is a question well worth the attention of those operators who base their assumption solely on past experience.

With only two lines from one comparatively small generating station and three lines from another station, short-circuit liability at an interconnected substation or at a customer's substation may be as great as at the generating station (Fig. 1). At the substation the fault energy is equal to that at the generating station. Such a liability as this may be easily incurred by direct connection to a primary system. It is plain, too, that the three-phase transformer is as much of a liability to the primary system as it is a protection. Also, it is clear that if the consumer's substation is interconnected with a third generating station of equal capacity, the fault energy at the consumer's substation may be 150 per cent of that at the generating station.

The paradox is emphasized in Fig. 2, in which it is assumed that the generating-station breakers, which are of the isolated-phase type, are permissibly of reduced interrupting capacity. There is good reason to believe that the desirability of utilizing isolated-phase breakers will be demonstrated after the worth of the isolated-phase type of power house is more firmly established. Ultimately, and for other reasons, only a few heavy-duty breakers will be required at the generating station.

Full application of the isolated-phase principle to the distribution centers and cable systems is shown in Fig. 3. In this case, even with transformers as large as 3,000 kva. at the consumer's substation and with a dead short circuit on the secondary terminals the fault energy on the primary system can be held down to the low limit of a primary ground-fault value. Ultimately, with the values given, the operation of this type of system would be but little affected by the occurrences of faults, and it might continue in operation safely until the faulty member had been retired. In this case the entire circuit-breaker equipment may have reduced interrupting capacity. Certainly all relay systems would be much simplified if it were possible to extend the time allowable for disconnection of faults instead of attempting the operation instantaneously. It is also possible that the phase angle as well as time element and current balance might be successfully used as a means of differentiating the fault from the power energy.

Savings in Capital Cost.—On a system similar to that first referred to, with a total of 300 consuming or distributing centers, a capacity of 300,000 kw. and with the standard reactor, relay and switching equipment, it is estimated that the energy-repression charge, now a feature of the conventional system and possible of elimination by the employment of the isolated-phase scheme, is as much as $1,000,000. The saving might be partly offset in the beginning by an immediate extra cost of single-conductor cable and single-phase transformers, but it is a fair assumption that the price increment should and would ultimately disappear by reason of simplified manufacturing methods possible.

But even if all the savings are permanently offset, if no reduction is made by the elimination of the energy-repression charge, the self-limiting character of the isolated-phase system is distinctly superior to the precarious three-conductor cable system with its energy-consuming reactors, its heavy-duty circuit breakers and its great liabilities. Engineers will agree that the perpetuation of such liabilities when means for their abolishment are at hand may logically be expected to result in drastic regulations, or restrictions may pile up an interest charge of $1,000,000 on additional protective equipment or construction in a futile attempt to control the liabilities of large systems.

More Large Generating Systems

TWO large generating systems with an output of more than 100,000,000 kw.-hr. during 1923 were omitted from the tabulation on page 716 of the April 12 issue of the ELECTRICAL WORLD, for the reason that the information was not available at the time of going to press. One of these companies was the Louisville Gas & Electric Company, which reports a total output of 160,754,592 kw.-hr. during 1923, of which 160,450,992 kw.-hr. was generated and 303,600 kw.-hr. was purchased. The peak load of the company was 45,100 kw. and took place on December 4, 1923.

The second company was the Oklahoma Gas & Electric Company, with an output in 1923 of 108,364,544 kw.-hr., of which 69,396,177 kw.-hr. was generated and 38,968,367 kw.-hr. was purchased. The peak load for the year was 30,850 kw. and took place in December.

These two additional companies make a total of 110 electric light and power companies in the United States and Canada having an output of more than 100,000,000 kw.-hr. during 1923.

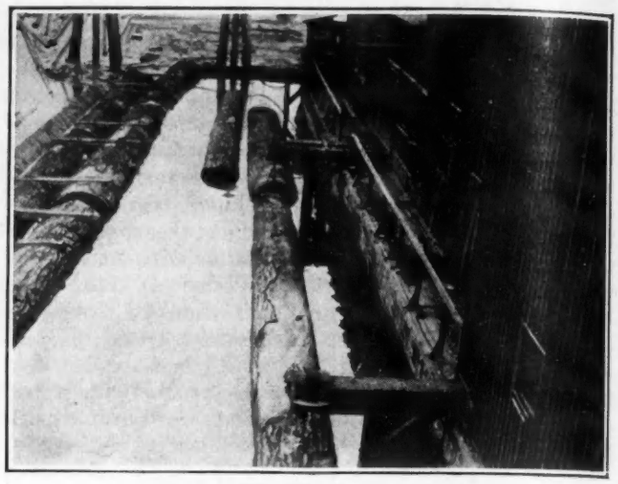
Floating Power House

A 1,500-Kva. Steam Plant Installed on a Barge Equipped with Outriggers Gives Cheapest Power for Temporary Construction Purposes

BY FRANK R. INNES
Sessions Engineering Company, Chicago

EVERY student of the advertising pages of current publications, including the most widely circulated American weekly, knows about Longview, the city which is being built to order where the Cowlitz River joins the Columbia in its flow to the Pacific Ocean. The building of the city and the construction of the mammoth lumber mills which are the reasons for its birth required from the first a reliable and adequate supply of electrical energy. Longview possessed every advantage of location—tidewater, rail connections, climate—except one. That was electrical service. Longview was in the embarrassing position of being just far enough away from both the systems in Washington to the north and those in Oregon to the south to make it expensive to get sufficient power from either. In view of the fact that the mill design included a 36,000-kva. plant to be operated on the fuel provided by the wood refuse from the mill, it is not at all remarkable that the contiguous electrical systems should refuse to incur large expenditures in line construction for a load that would at best last no longer than a year or so. Longview was at first supplied from one of the northern systems, but finally, when a comparatively large additional block of load had to be arranged for, the only thing that could be done was to provide a temporary plant as a local source of power.

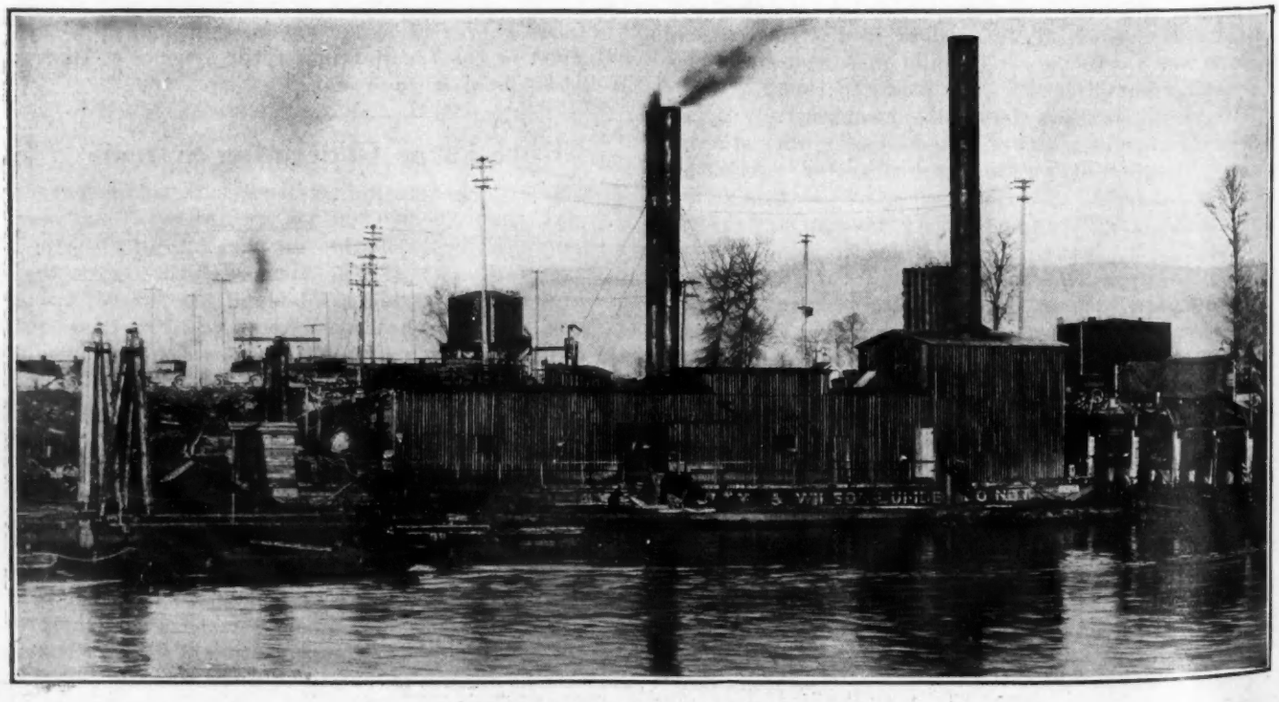
At Longview the Columbia River has a tide variation of about 5 ft., and the river has also its seasonal changes in level, which are not slight. At the mill site, where the power plant would naturally be located, the river bank has a mean elevation of 30 ft. above low water level. Owing to these conditions the erection of the most temporary plant threatened a heavy expense.



LOG OUTRIGGERS AND WAVE-CONTROL BOOM

The circulating water would have to be hauled in from the river over the river bank and then pumped back again. The maximum range in the level of the river and the resultant length of lines called for pumping equipment quite out of proportion to the rest of the plant. The matter of foundations on the ground immediately back of the river bank was a vexing condition. It was important also that the plant be in operation within an almost impossibly short space of time, and the delay that the construction of concrete foundations would entail was a disturbing factor. With these things all in mind the idea arose of putting the plant on the river, thus making it self-compensating for changes in water level and abolishing the problem of foundations. There were several barges of large capacity to be had, and one of them, with the plant on board, could be moored close to shore and connections made to a fuel-oil line and outgoing energy leads. This decision was made.

A 1,500-kva., 440-volt Allis-Chalmers turbo-generator was found in storage at the United States Army ware-



EXTERIOR OF THE FLOATING POWER PLANT

house in Vancouver, Wash. A quota of oil-fired, locomotive-type boilers was drafted into service. A 500-ton barge was assigned to the plant as substructure. It was decided to install the equipment on the barge under cranes at Portland and tow the complete plant to Longview.

While the barge was on its way the Sessions Engineering Company, consulting engineer on the Longview project, was designing the arrangement of accessories and power-plant basic requirements. Because of the barometric condenser connections it was necessary to set the turbine above the deck of the barge. On account of the weight of the equipment the bulkheading had to be reinforced. By the time the barge, turbine, boilers and auxiliary equipment had been concentrated at Portland, the plans were ready and work began.

The generator had to be rewound for 2,300 volts, the barge reinforced and the plant assembled and installed. This work was accomplished in twenty days, and the barge started on her trip back to Longview. In five hours it was at its moorings and the oil-pipe connections from the tank on shore were being made. A pole line had been run to the bank of the river and was quickly hooked up. In twenty-eight days from the time the floating plant was decided upon it was delivering energy, and it has continued to do so at its full turbine capacity and very satisfactorily. The steam pressure is 150 lb. at the throttle. The oil is preheated before it enters the burners and the combustion air is also preheated as it enters the furnaces through an arrangement of firebrick baffles. The oil is furnished from the main tank on shore to a 200-bbl. storage tank on the barge. This tank serves two purposes, one as a reserve in case of interruption in the feeder line, and the other in assisting to trim the barge against the weight of the generating machinery.

Some apprehension was felt at first concerning the ability of a turbine which was designed for operation on terra firma to function satisfactorily and safely on the comparatively unstable surface of the river, and in order to prevent rolling the barge was fitted with heavy log outriggers on each side and a log boom was drawn around it to minimize the wave action. Now, when a steamer goes past spreading ranks of "rollers" across the river behind it, the barge rises and falls sedately, with no apparent displacement of the deck.

Stringing Transmission Cable

Nature of Preliminary Study, Special Equipment and Methods Employed on the Indiana Electric Corporation's 74-Mile, 132-Kv. Line Between Terre Haute and Indianapolis—Special Equipment Not Insisted On

By OLE DAVIDSON

Superintendent of Construction Indiana Electric Corporation, Indianapolis

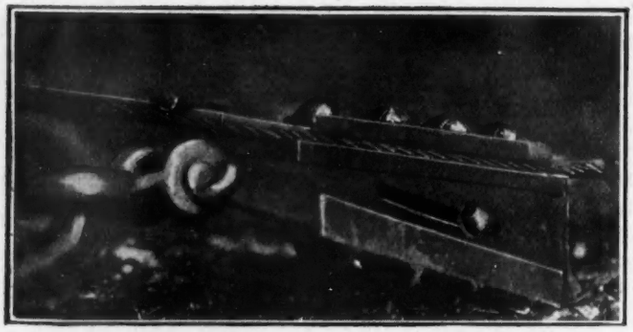
SOME modifications of the usual methods of stringing transmission-line conductors which may be of interest to other companies were used on the recently constructed 132-kv. transmission line of the Indiana Electric Corporation between Terre Haute and Indianapolis. This line, which is 74 miles long, is supported on steel towers placed 800 ft. apart and consists of six No. 4/0 nineteen-strand copper conductors and one $\frac{7}{16}$-in. galvanized Siemens-Martin seven-strand ground cable. The insulators are the Ohio Brass ball-and-socket type No. 25622, provided with a hook connection for attaching to the tower. Nine disks per string were used in suspension and eleven disks in strain. With a maximum loading of $\frac{1}{2}$ in. of ice and 8 lb. wind pressure at 32 deg. F., the maximum tension in the copper cable is 5,000 lb. The copper cables came in 1.21-mile reels, weighing 4,400 lb.; the ground cable in 1 mile reels, weighing 2,300 lb.

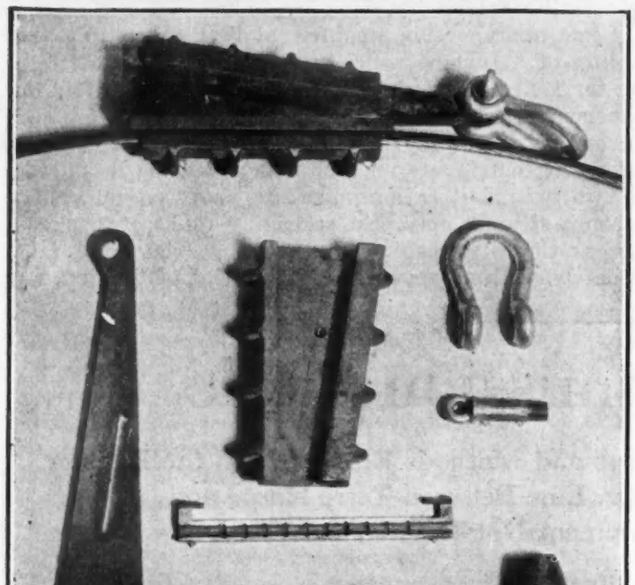
Before starting the stringing of conductors the route of the line was studied as a whole, particular consideration being given to accessibility and working space. The spotting of reels was also carefully worked out in the office, attention being given to each individual location. In most cases twelve reels of copper were placed at each point. The locations of the reel set-ups were tabulated for the guidance of the distributing and stringing foremen. When the set-up was to be made alongside a road, the stringing foreman designated the side of the road on which it was to be made.

Special equipment was used in stringing the conductors, including stringing sheaves, special platforms for installing dead-ends, transfer bridles and single blocks for raising conductors during attachment to insulators, temporary dead-ends to assist stringing of the conductors, gasoline-engine-driven winches and special "come-alongs."

The most important item of the special equipment is the string sheave. The type selected (as shown in the illustration) involves a 6-in. x $2\frac{1}{8}$-in. sheave wheel set in a closed frame, necessitating the taking out of a bolt to insert the cable. The block was attached to a $\frac{1}{2}$-in. B.B chain by a shackle, the chain terminating in a stock hook which could be inserted in the insulator connection on the tower. The reasons for using a closed frame were to reduce the weight, to prevent cutting of the cable between the frame and the wheel, and to keep the cable from jumping out when there is a surplus of slack. A chain was used to insure proper alignment of the sheave. The throat of this sheave is large enough to permit the passage of a joint of the standard twisted-sleeve type. This type of sheave was used at dead-end towers without the chain by supporting it with a special hook which gripped the lower flanges of the cross-arms. The same sheave was used for stringing the ground wire. To carry on this work a $2\frac{1}{2}$-in. x $2\frac{1}{2}$-in. x $\frac{3}{8}$-in. x 8-ft. angle iron was clamped to the tower head in such a way that it could be used to support the sheave a little above and to one side (fore and aft) of the ground-wire clamp. This standardization of sheaves simplifies their distribution.

For putting in the dead-end insulators a special platform was designed, one end over the cross-arm and the other over the cable beyond the strain clamp. The platform hung 24 in. below the cable at the outboard end

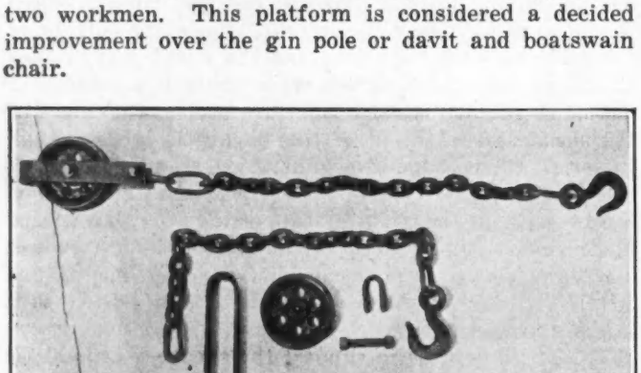




FIGS. 1 AND 2—DETAILS OF SPECIAL "COME-ALONG" AND ONE IN ACTION

When in action the pull is exerted on the wedge-shaped bar fitting into the wedge-shaped channel. The conductor is laid alongside of the channel. Between it and the wedge is a bar with a concave edge in which are grooves that insure a firm grip on the cable. This particular "come-along" was used with No. 4/0 copper wire.

and 38 in. below the cross-arm at the other end. The platform, which weighs about 80 lb., is made of steel with a wooden-slat floor, constituting a safe support for two workmen. This platform is considered a decided improvement over the gin pole or davit and boatswain chair.



FIGS. 3 AND 4—DETAILS OF STRINGING SHEAVE WHICH FACILITATED OPERATIONS

The sheave consists of a U-shaped yoke in which a 6-in. grooved wheel is supported on a through-bolt serving as a shaft. A through-bolt joining the open end of the U-shaped yoke serves as the means of attachment for the clevis passed through the end link of the chain.

With this equipment two highmen and four groundmen put in a complete dead-end—that is, twelve strings of eleven-disk insulators—in two to three hours. However, numerous circumstances arise which militate against continued performance at this rate.

To raise the cable for attachment to the insulator at the suspension insulator points, a transfer bridle was developed consisting of two ¾-in. turnbuckles with 24-in. take-ups, a yoke at the top to hook over the cross-arm and a spreader and hooks at the bottom for supporting the cable. To break in new men a chair was used in connection with the transfer bridle. After the men became accustomed to their duties they worked from the cross-arm and the cable.

It was not the policy of the company to insist on the use of special equipment. Consequently some methods were devised by the foremen. One substitute for raising the cable with the transfer bridle involves the use of two 6-in. single blocks with a ½-in. fall line. It has some advantages which commend it.

One block was hooked over the cross-arm about 2 ft. from the insulator connection, and the other on the cable about 1 ft. from the clamp. In raising the cable it was brought in toward the tower. The hand line for raising the insulators was hung near the end of the cross-arm outside the cable. With these arrangements there was nothing to obstruct raising the insulator string. A 14-ft. ladder with long hooks to hang on the cross-arm permitted the highman to transfer himself easily from the cable, where he fastened the clamp, to the cross-arm, where he had to hook the insulator before fastening it to the clamp.

With two transfer bridles, four highmen, two groundmen and a team put insulators in place at the rate of seventy-two strings per nine-hour day. With the ladder-and-block method two highmen and five groundmen put up sixty strings in a nine-hour day. During a speed trial one highman put up three strings on one side of the tower in twenty-two minutes. However, this performance cannot be maintained since it is seldom possible to keep a crew at this work continuously.

Owing to the long distance between dead-ends, temporary dead-ends were established at convenient intermediate points so that no pull would exceed 1½ miles to 2 miles. This separation of temporary dead-ends afforded a satisfactory pulling distance from the standpoint of properly sagging the cable. The temporary dead-end consisted of a "come-along" and a ⅞-in. turnbuckle, with 12-in. take-up fastened to the cross-arm with a shackle.

In stringing the cable a 1,200-ft. pulling line of ⅝-in. rope was used. Teams were employed as a rule, although tractors of both wheel and caterpillar type were employed. Owing to the very wet weather which existed in the fall when these operations commenced, however, the tractors could not be used satisfactorily, because they would have been detrimental to the very soft fields and meadows. Neither could they be used during the very cold winter when the job terminated, because the ground froze so hard that the tractors could not maintain their footings.

For pulling the line up to the specified sag, a "Novo" type 8G gasoline-engine-driven winch was used with a drum carrying 500 ft. of ⅞-in. hoisting cable. The engine was mounted on a wagon gear, using 8-in. x 8-in. timbers for the engine bed. This wagon was hauled by team to the pulling point (usually at a tower) and anchored. The hoist would pull up to the specified sag

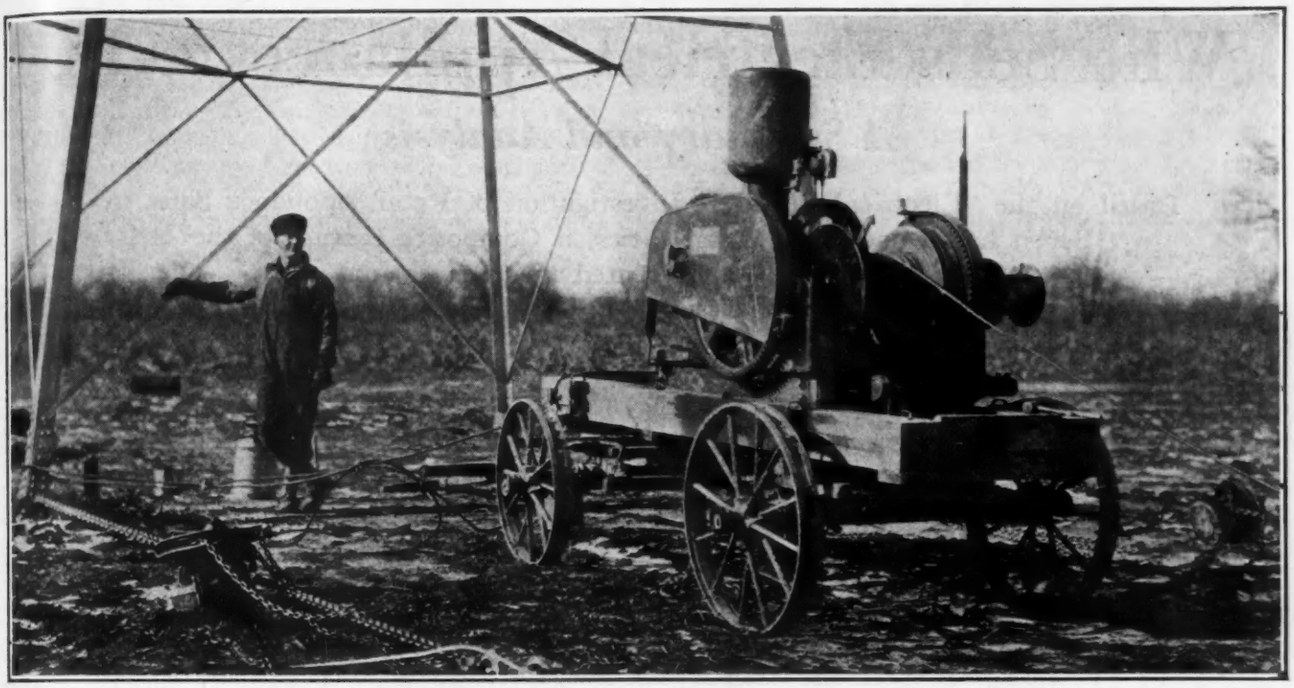


FIG. 5—GASOLINE-ENGINE-DRIVEN WINCH WITH CHAIN FALLS AND "COME-ALONGS"

It may be noted that the chain falls from the "come-alongs," as well as the wagon supporting the gasoline-engine-driven winch, are attached to the base of the tower toward which the conductor is being pulled.

on a direct pull. Then the load was transferred to 3,000-lb. spur-geared chain falls having 20-ft. take-ups. This obviated the use of multi-sheave blocks. The pulling operation was handled by one engineer and a helper.

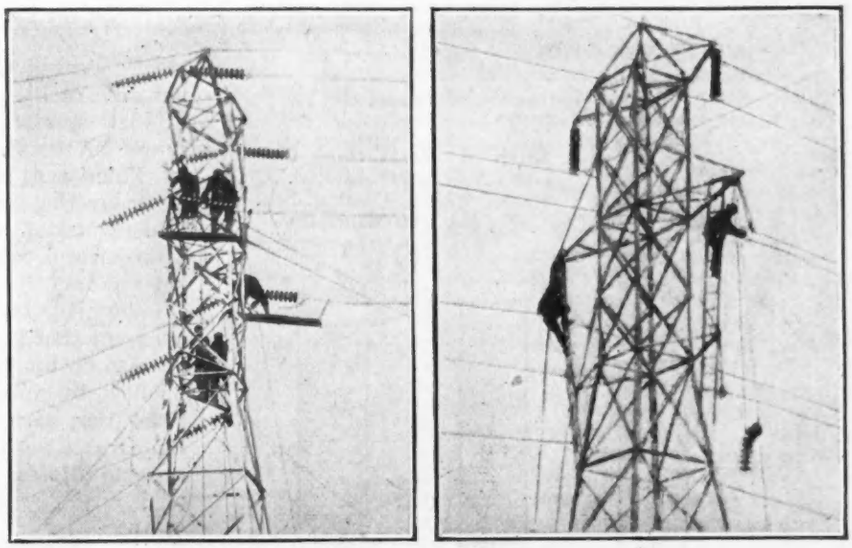
To raise the cable reels off the ground during the wire-stringing operation, screw jacks were taken from stock which had heads for supporting shafts. Old rope was used to guy the jacks back to stakes.

Pulling of the cable was accomplished with a specially designed "come-along" tested to 6,000 lb. before final acceptance. The principal features of this "come-along" are the length of grip, which gives sufficient friction without marring the cable, and the direct alignment of the conductor and pulling cable.

Performances in stringing cable over a considerable distance can be given, but the conditions are so variable as to be hardly applicable elsewhere. However, for any service that the information may be to other companies, it may be stated that one camp foreman starting with a good crew of tower erectors (but green at cable stringing) completed the stringing of 19 miles of line, including the six conductors and one ground cable, in thirty-eight working days—from Nov. 13 to Jan. 3. This was done during very wet and disagreeable weather and over three holidays, Thanksgiving, Christmas and New Year. The crew consisted of an average of three pushers, four teams and twenty-four men, the teams being used for stringing and the gasoline-engine-driven winch for pulling up the conductors. No "hot lines" were encountered throughout the section in which this line ran, but there were two telephone leads of importance, one railroad crossing and two large creek crossings. Wire stringing was facilitated by construction of gates at all fences.

The speed and economy of cable stringing is determined largely by the sheaves available. It is to be hoped that some equipment company will see its way clear to put out first-class sheaves on a rental basis.

Kelsey, Brewer & Company of Grand Rapids, Mich., were the constructing engineers on this job. L. B. Andrus is the vice-president and chief engineer, and F. G. Dana is general superintendent.



FIGS. 6 AND 7—DEAD-END PLATFORM AND LADDERS AND BLOCK USED FOR TYING IN STRAIN INSULATORS

The platform is made of steel with a wooden-slat floor and constitutes a safe support for two workmen. The outboard end hangs 24 in. below the cable and the other end 30 in. below the cross-arm. The platform is supported by hooks over the cable and cross-arm. On the suspension-unit tower two men may be seen standing on ladders hooked to the cross-arms tying in the conductors, so that the insulator strings may be raised into position without encountering any obstruction and fastened to the cross-arm and conductor clamps respectively.

Who Sells Electrical Appliances?—IX

A Summary and Analysis

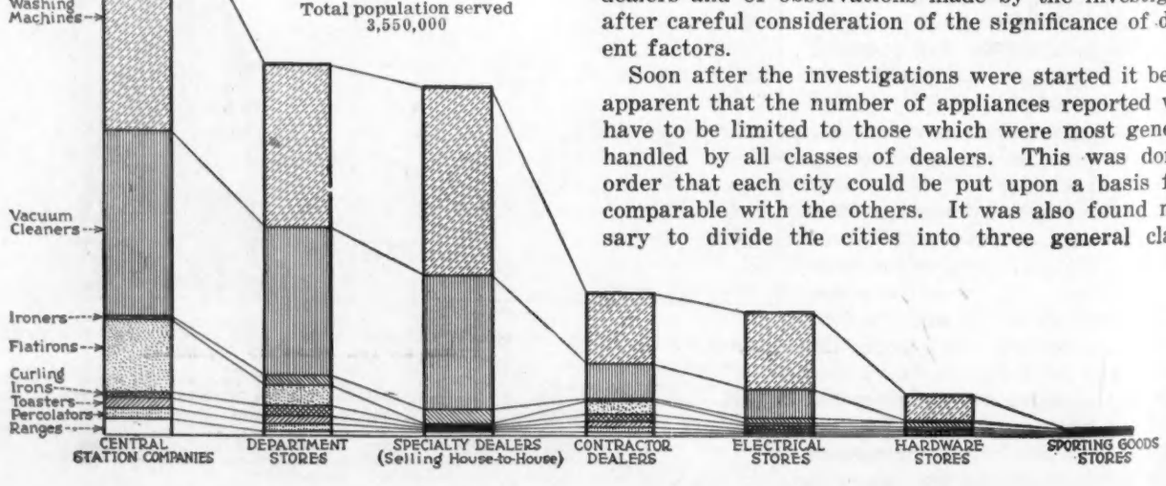
Based on the "Electrical World's" Investigation of Retail Appliance Sales in Seven Large and Four Small Cities, a Composite Picture of the Conditions Found Is Presented with Conclusions as to the Trend of the Business

THOUGH the investigation by the ELECTRICAL WORLD of the appliance business was undertaken to analyze the parts played by various retail channels, the one outstanding impression gained from such an analysis is the rapidly increasing volume of the business taken as a whole. It is naturally of great interest to the central-station companies, whose kilowatt-hour sales are so directly affected by the gross volume of appliances connected to their lines, and also to manufacturers and distributors of appliances in acquainting them with the parts played by different agencies. It must be recognized that while this rapid increase in total volume has been going on there has also been a shifting of the business from stores of one class to other kinds of dealers, which means that conditions have been changing even during the eight months of this survey, and conclusions must be judged in the light of these facts.

FOR the purpose of analyzing the parts played by the various retail outlets in the rapidly increasing volume of electrical appliance sales to the public, the ELECTRICAL WORLD has been making an investigation which so far has extended over a period of eight months, more than 350 retail dealers having been interviewed. In the previous eight articles the situation in each of the seven large cities and in the four small cities covered by this survey has been related. In this article an attempt is made to analyze and interpret the facts uncovered in these eleven cities to see what, if any, conclusions may be reached as to the present condition and future tendency in the distribution and marketing of energy-consuming appliances. These devices and their marketing are at once of great interest to the central-station company in its load building and extension of electric service, and to the manufacturer and distributor of electrical goods as a business. The conclusions reached must be judged with a full knowledge of the source from which they were obtained. Certain other large cities will present conditions which will not be the same, nor do the four smaller cities present what might be found in a more inclusive survey. The combined population of all the cities investigated was approximately 6,000,000, and the investigation may be viewed as a cross-section affecting that portion of the population of the entire country.

In each of the previous articles the characteristics of the city then under scrutiny were described. Two of the larger cities were at the opposite extremes of the country, one on the Atlantic and one on the Pacific Coast; another was a Western city; three were in the Middle West and one in a North Central state, as was one of the small cities. The three other small cities were east of the Allegheny Mountains. The total population for the eleven cities, as given by the United States Census Bureau for 1920, was 4,045,000. This, however, represents only the people residing within the corporate limits of the cities, and it is estimated that approximately 6,000,000 people may be considered as tributary to the dealers of all kinds in the cities investigated. To this extent, then, the investigation may be considered as a cross-section of the retail electrical appliance business throughout the country. While it is true that many parallel conditions were found to exist in cities widely separated geographically, it should be borne in mind that conditions which have appeared to be typical in the eleven cities would not necessarily apply in another city, where there may be some special circumstance or situation. During the course of the survey more than 350 retailers of different kinds were interviewed, and the statements here set forth are the direct result of statements made by these dealers and of observations made by the investigators after careful consideration of the significance of different factors.

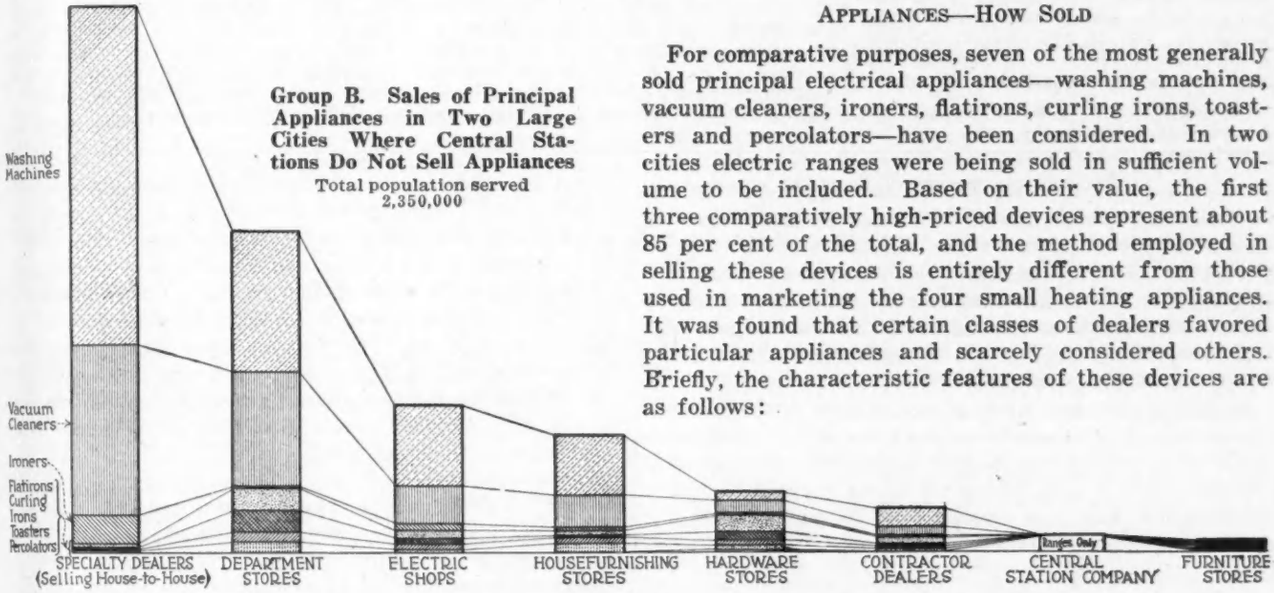
Soon after the investigations were started it became apparent that the number of appliances reported would have to be limited to those which were most generally handled by all classes of dealers. This was done in order that each city could be put upon a basis fairly comparable with the others. It was also found necessary to divide the cities into three general classes.



Group A. Retail Sales of Principal Appliances in Five Large Cities Where Central Stations Are Merchandising

Total population served 3,550,000

To get an accurate view of the relative volume of business transacted by different kinds of dealers, the sales in the eleven cities have, therefore, been divided and tabulated under the following three general classifications: First, Group A, which includes the five cities of 200,000 to 800,000 population, in each of which the central-station company is actively selling appliances; second, Group B, the two cities of 800,000 and 600,000 population where the central stations do not sell appliances, and, third, Group C, four small cities, aggregating 100,000 population, in all of which the central-station companies sell appliances more or less actively. The total sales by different dealers are shown in the accompanying tabulations, arranged to show the percentage of sales of each appliance by each class of dealer, the dealers' proportion of sales of that particular appliance and the proportion of the total appliance business done by each class in each city. A recapitulation of the total sales by electrical and non-electrical dealers in each city is also given.



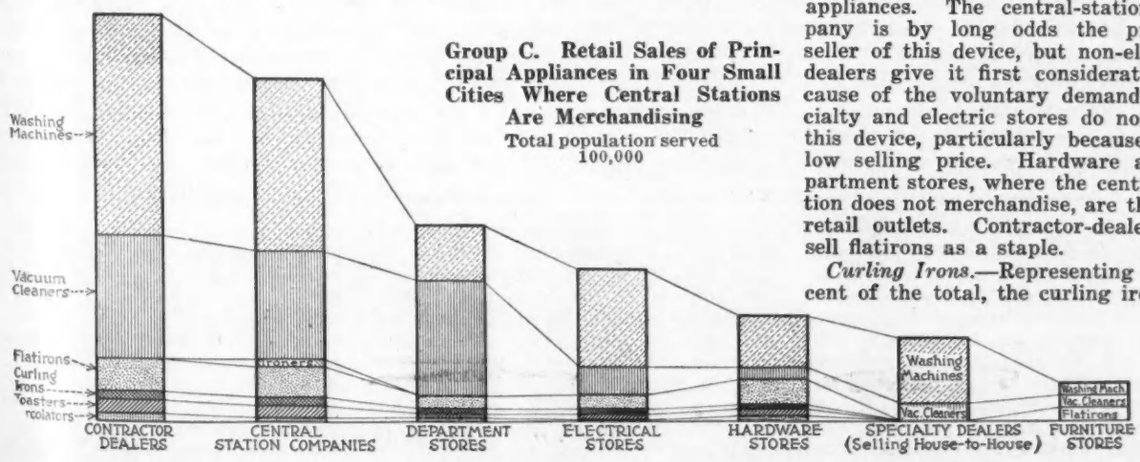
Group B. Sales of Principal Appliances in Two Large Cities Where Central Stations Do Not Sell Appliances
Total population served 2,350,000

APPLIANCES—HOW SOLD

For comparative purposes, seven of the most generally sold principal electrical appliances—washing machines, vacuum cleaners, ironers, flatirons, curling irons, toasters and percolators—have been considered. In two cities electric ranges were being sold in sufficient volume to be included. Based on their value, the first three comparatively high-priced devices represent about 85 per cent of the total, and the method employed in selling these devices is entirely different from those used in marketing the four small heating appliances. It was found that certain classes of dealers favored particular appliances and scarcely considered others. Briefly, the characteristic features of these devices are as follows:

Washing Machines. — Of the total volume of sales, washing machines represented 49.6 per cent, and their more rapid distribution has been the principal cause for opening many specialty and factory branch stores. Probably 95 per cent of all the sales are made by house-to-house salesmen working on a commission basis. At the time this investigation was started about one-half of the specialty stores selling washing machines were factory branch stores; the other specialty stores were privately owned. Since that time there has been a marked tendency of the manufacturer to abandon sales through his own specialty stores and seek outlets through already established dealers, such as the central-station company, department, furniture and housefurnishing store, and in some cases privately owned specialty dealers. There has not, however, been a marked increase in the number of privately owned specialty stores, and the manufacturers appear to prefer to enter into a resale agreement with some well-known local dealers. Hardware stores in the East sell virtually none of these appliances, while in the Middle West and to a certain extent on the Pacific Coast they are making some headway. Between 85 and 90 per cent of all sales are made on deferred payments.

Vacuum Cleaners. — The vacuum cleaner is second in volume of sales, amounting to 32.7 per cent of the total. Like the washing machine, it is sold to a certain extent through specialty and factory branch stores by the same method. Some manufacturers maintain a nation-wide organization of house-to-house salesmen, selling direct to the users. Most manufacturers, however, appear to prefer selling through some local dealer on a resale plan, and for this purpose the central station and the department store are most favored.



Group C. Retail Sales of Principal Appliances in Four Small Cities Where Central Stations Are Merchandising
Total population served 100,000

Ironers.—Considerable difficulty has been experienced selling these devices because of the amount of demonstration and instruction that must go with each sale. Where there has been intensive missionary work upon the appliance sales have been materially increased. It remains, however, the least important in volume of the three major devices, representing 3.8 per cent of the total.

Flatirons. — Although representing only 6.4 per cent of the total, the electric iron is the leading staple of all the appliances. The central-station company is by long odds the principal seller of this device, but non-electrical dealers give it first consideration because of the voluntary demand. Specialty and electric stores do not favor this device, particularly because of its low selling price. Hardware and department stores, where the central station does not merchandise, are the chief retail outlets. Contractor-dealers also sell flatirons as a staple.

Curling Irons.—Representing 2.5 per cent of the total, the curling iron dur-

ing the last two or three years has been used as a "special" by drug, department and hardware stores, which have accounted for around 60 per cent of these sales, and the low price and general popularity have made it an ideal piece of "over-the-counter" merchandise.

Toasters.—Sales of these appliances amount to 1.8 per cent of the total. The toaster is rapidly becoming a staple, particularly with the central-station company, contractor-dealers, electric stores, department and hardware stores, whose sales are divided about 35, 20, 10, 30 and 5 per cent respectively. It is sold largely over the counter and by advertising efforts.

Percolators.—In volume of sales these devices represent 1.9 per cent of the total, but the number of sales is about half that of toasters, which seems to be a fair measure of the popularity of the two appliances. Sales are through about the same outlets in the same proportion. The percolator is more of a style item than a staple.

Ranges.—In only two cities were ranges being pushed, and in one the two central-station companies made this an exception to their non-merchandising policy. Sales represent 1.3 per cent of the total. Essentially the range is a pioneer appliance still in the introductory stage, and the central stations sell 73 per cent of all ranges. It requires highly specialized selling and demonstration, which the central-station company is depended upon by all other dealers to supply.

Incandescent Lamps.—Although not included in the tabulation of sales, incandescent lamps play an important part in appliance sales in attracting customers to a dealer's store. Sales are principally by the central-station company and contractor-dealers, though the hardware stores are beginning to handle them and will probably materially increase their activities. Where the central station has a free lamp-renewal policy in effect lamp sales by dealers are extremely low. Other non-electrical dealers and electrical specialty stores cannot be considered a factor in lamp distribution.

DIVISION OF SALES BY DEALERS

The exact proportion of the sales by each class of dealer is given in the three tabulations. It will be seen that washing machines, vacuum cleaners and ironers are the most important items. It is interesting to note, however, how the sales of the small appliances are distributed among the non-electrical dealers, the electrical dealers and the central-station companies. A comparison of the three groups shows that in those cities where the central station is selling appliances sales are pretty evenly divided among the three general classes, while in the two other cities the non-electrical dealers are doing an average of 75 per cent of the heating appliance business.

PROPORTION OF SMALL APPLIANCE SALES BY NON-ELECTRICAL AND ELECTRICAL DEALERS AND CENTRAL STATIONS

	Non-Electrical Dealers	Electrical Dealers	Central Stations
Group A			
Flatirons	21.9	18.0	62.1
Curling irons	52.0	28.2	18.8
Toasters	35.3	29.3	35.4
Percolators	38.6	25.3	36.1
Group B:			
Flatirons	75.1	24.9	....
Curling irons	80.5	19.5	....
Toasters	67.0	33.0	....
Percolators	82.5	17.5	....
Group C:			
Flatirons	35.4	39.0	25.6
Curling irons	30.2	41.4	28.4
Toasters	28.4	40.1	31.5
Percolators	37.7	43.8	18.5

From the recapitulation of sales by different classes of dealers it at once becomes apparent that whether the central-station company does or does not merchandise has a strong influence on how the volume of sales is apportioned among dealers. In cities I, II, III, IV, V and VIII, where the central stations actively sell appliances, electrical dealers, including the central stations, are doing 84, 74.9, 70.7, 67.6, 70.3 and 75 per cent of the appliance business, the remainder, averaging about one-fourth of the total, being divided variously among hardware, department, housefurnishing, furniture and (in city V) sporting-goods stores. Contrasted with this, in cities VI and VII, where the central stations adhere to a non-merchandising policy, the electrical dealers are doing but 52.1 and 55 per cent. Furthermore, in each of the two latter cities electrical contractor-dealers account for only 3.5 per cent of the appliance sales, while in the nine other cities their sales range from 6.2 to 31.2 per cent of the total. Viewed on the cold evidence of these figures, it is apparent that where the central station abandons or refrains from the sale of electrical appliances the business does not, as might be expected, go to the contractor-dealer, but to his non-electrical competitors instead. In the two cities, VI and VII, the contractor-dealers were found to be apathetic and indifferent about their appliance business, many instances having been found where they had completely discontinued their sales because they felt they could not compete with the non-electrical dealers. In the other six cities the contractor-dealers were in a much better frame of mind, and while some of them were opposed to the central station merchandising, their portion of the total appliance business was actually much higher.

CLASSIFICATION OF DEALERS

Broadly, electrical appliances are sold by four kinds of electrical dealers and five kinds of non-electrical dealers, although the sporting-goods store might be easily eliminated. In the cities under Group A electrical dealers, including the central-station companies, are selling 73.8 per cent of the appliances, the remainder being divided among hardware stores, 2.5 per cent, and department stores, 23.7 per cent. Group B shows the electrical dealers to be doing 59.2 per cent of the business, hardware stores 4.5 per cent, department stores 26.5 per cent, housefurnishing stores 9.3 per cent, and furniture stores 1.6 per cent. The electrical dealers in Group C account for 75 per cent, the hardware stores for 7.4 per cent, department stores for 14.6 per cent, and furniture stores for 3.1 per cent. The characteristics of each class of dealer are described individually.

Hardware Stores.—As a class the hardware dealer handles only the appliances for which there is a natural demand. He is not equipped and does not care to do house-to-house selling, which involves supervision of outside sales crews and the handling of deferred payments. There are two striking exceptions, which distort the total figures somewhat. In city I one hardware dealer conducted a continuous advertising campaign, offering washing machines on a deferred-payment basis. In city VII there were two hardware stores doing 90 per cent of the hardware-store electric appliance business, and both of these employed outside salesmen. As a general rule, however, only in some of the Middle Western cities and on the Pacific Coast can the hardware dealers be considered as an important factor in the sale of the larger appliances. In most cities they are inclined to permit the business to increase as it will, as so far the natural growth has been pleasing and satisfactory, the business is steady the year round and discounts measure up well with other lines of hardware. Purchases are made direct from manufacturers, hardware jobbers, and also from electrical jobbers, although the hardware man does not seem to get as good

discounts from the latter as from the others. Depending on the locality and whether they sell any of the larger devices, hardware stores are doing from less than 1 per cent to as much as 8 per cent of the appliance business. Between 2 and 4 per cent would be a fairly high average.

Sporting-Goods Stores.—In only one city was this class of store undertaking to do a household appliance business, and there it has been a disappointment to the owners. Consequently they were narrowing down their stocks and cannot be considered a factor. Some sporting-goods stores are doing a fair volume on radio, flashlights and batteries.

Department Stores.—Within the last three years department stores have made by far the greatest strides in the sale of household electrical devices. They have many advantages over other dealers in store location, shopping habits of the public, advertising, buying power and proved business ability. It it against their policy to undertake to sell any device until they are confident that it has passed the development stage and can be sold without excessive introductory cost. Department-store buyers go to manufacturers to make their purchases, and because of the volume of their individual orders demand that they be accorded the jobbers' discount. They require discounts from 35 to 50 per cent, depending upon the class of merchandise and conditions under which it must be sold. On the larger devices, washing machines and vacuum cleaners, approximately 75 per cent of the sales are made under resale agreements with manufacturers, while the remaining 25 per cent is about evenly divided between sales made by outside salesmen employed directly by the store and through advertising at reduced prices. The smaller devices are classed by the department stores as "over-the-counter" merchandise, and sales are effected by advertising pressure and some price cutting.

Many stores are establishing a repair service, but are not doing any more free work than is called for under the manufacturer's guarantee. In some cases a profit is being made on this work. Although electrical appliance sales by this class of store have shown rapid increases in the past four years, department managers have observed within the last year a certain flattening of the curve of increase, indicating that former yearly increases of 35 to 50 per cent caused by their attracting business from other dealers are steadying down more nearly to a normal growth of 20 to 25 per cent. It appears probable, therefore, that department stores have reached the peak of their growth and that their proportion of the appliance business will remain around 25 to 30 per cent of the total for a city.

Housefurnishing and Furniture Stores.—From the investigation these two classes of stores are the most difficult to differentiate between. The conditions found in one city, VII, were not parallel with those found in city VI. Washing machines and vacuum cleaners make up the largest volume of these stores' sales. The one housefurnishing store in city VII, which had the largest volume of sales, operates an aggressive house-to-house sales crew. The household furnishing stores as a class in this city are also doing a very fair volume of small-appliance business. Two furniture stores were working under resale agreements with manufacturers, and the others carry electrical appliances to round out their stock. It was found that furniture stores are coming to look with more favor on the washing-machine business, because they are accustomed to sell furniture on deferred payments, and the method of selling this large appliance is familiar to them. The vacuum cleaner is less popular because the sales price is not so high. The combined appliance business of the household furnishings and the furniture store may amount to 5 to 7 per cent of the total.

Contractor-Dealers.—Of the electrical dealers selling appliances, the contractor-dealer is in a peculiar position so far as this branch of his business is concerned. At times when there is a considerable amount of new building going on in a city the contractor must perforce give most of his attention to wiring. Primarily he is a contractor and not a merchandiser, so naturally he favors that part of the business with which he is most familiar. It is but natural that during slack times he should turn to the sale of appliances to build up his earnings. In the small town the contractor is in closer touch with his customers, and, so far as the investigation shows, his proportion of the appliance business is much higher than that of his counterpart in the larger city. As a class, however, the contractor-dealer finds the discounts too short. He usually buys in small quantities through a jobber, and 25 to 30 per cent discount does not permit of servicing appliances nor meeting the competition from department stores and other dealers, whose larger buying powers gain them better discounts. In those cities where the central station is merchandising, contractor-dealers' sales vary from 6 to 17 per cent, and in the small towns they are as much as 31 per cent of the total. In the other cities they are only 3.4 per cent and appear to be standing still. Under existing conditions, when there is general building activity over the entire country, contractor-dealers are gradually becoming a less important factor in the sale of appliances. If the present conditions continue, it seems safe to assume that the contractor-dealers' appliance business will range between 6 and 10 per cent of the total in the larger cities.

Electrical Stores.—This class of store handles a general line of electrical goods, including appliances, fixtures, portable lamps and radio equipment, but does no wiring. Within the last few years radio has been the salvation of many of these dealers. To do a sufficient volume of appliance business they must sell a large quantity of the higher-priced devices, and this has been found impossible without the use of house-to-house salesmen. Such stores as have succeeded in appliance selling use outside crews, who account for fully 75 per cent of such sales. It is a serious problem for this class of store to find capable salesmen for this work, as the small dealer is not equipped to train new men. Appliance sales in the strictly electrical stores are in some cases increasing slowly, and in others they are at a standstill. They are, however, making up this deficiency on radio equipment, fixtures, portables and incandescent lamps, but the appliance business may be expected to remain at about 8 per cent of the total volume.

Specialty Stores. — Only the three large appliances interest this class of store, as 95 per cent of their sales are made by house-to-house salesmen on a commission basis. About one-half the specialty stores when the investigation was started were privately owned, and others were direct representatives of manufacturers of washing machines or vacuum cleaners established by the manufacturers when they could not find satisfactory dealer representation in a given city. This situation is changing, and many manufacturers are now negotiating resale contracts with central-station companies, department stores, furniture stores, contractor-dealers, some privately owned specialty stores and, lastly, hardware dealers. Among the privately owned specialty stores there were about a year or so ago a number of failures due principally to overextension of credit and the serious difficulty of obtaining salesmen. There will always be a new crop of specialty dealers to replace such failures, and with sales formerly made by manufacturer's branch stores now going to other classes of dealers, it looks as though the privately owned specialty store's sales will remain at about 25 per cent of the total.

Central-Station Companies. — Central-station companies present the interesting paradox of staging a successful "come-back" in the merchandising business. A number of them during and after the war partially or wholly retired from the sale of appliances, having been urged from a number of points to leave this business to the other fellow. After a fair trial, however, central-station managers found that this policy was not working out as predicted. Customers complained of the poor quality of appliances that were being sold and that they were having difficulty in obtaining repairs. Appliance sales were drifting to non-electrical dealers instead of to the electrical dealers, who by training and experience would have been able to render an adequate repair service. Virtually no missionary work was being done by any dealers looking to the introduction of such pioneer devices as the range, domestic refrigerator, electric water heater and so forth, all of which require a certain period of unprofitable development work. Non-electrical dealers were frankly waiting until these devices were "proved up" before handling them, and other electrical dealers could not afford to carry on this work, nor have manufacturers seemed ready or able to "swing" it.

For these reasons there has been a swing-back in the policy of many central-station managers. They feel that it is their own responsibility to see that a standard quality of merchandise be made available to their cus-

tomers and that the central-station is in the best position to set this standard and discourage the sale of inferior devices by educating the public to use better appliances. There has also been a reversal of the policy under which appliances were sold, regardless of possible profits, for their energy-consumption value alone. The power company's merchandising departments are now required to operate on a self-supporting basis, as increased consumption and revenue will follow as a natural consequence and other dealers will not suffer from unfair cut-price competition. An actual profit is being made in a number of instances where well-appointed salesrooms have been installed and a capable sales force organized. The question of satisfactory salesmen has been a difficult one for the central station, as it has had to consider the effect upon its customers of the possibility of irresponsible house-to-house canvassers using strong-arm methods to close sales. This problem is being worked out by a number of companies which are gradually developing and training their own crews. In others the central station has entered into resale agreements with manufacturers, who must furnish a class of salesmen acceptable to the management of the company.

In this connection, also, the central-station company must develop men capable of carrying on the pioneering sales of new devices. In some companies there is talk and consideration of developing pioneer appliances by providing a special fund to carry on this work. General practice, however, is that the merchandising department is required to bear this expense. In the latter case it is more difficult, if not impossible, to show any profits from the purely merchandising business. How far the central-station companies are going in this pioneering work, and just how they are going to pay for it, only the future will disclose. The fact remains, however, that there is no other agency capable of doing it, and unless the responsibility is assumed by the central station, the general use of such appliances will be indefinitely delayed.

PRESENT CONDITIONS

Looking at the conditions in the cities investigated, it was found that where the central-station company sells appliances it is doing by far the largest volume of business of any one class of dealers. Central-station sales in the five cities under Group A account for an average of 35.2 per cent of the total, and it will be seen from the tabulation that their small-heating-appliance sales are higher than those of any other dealer. The power company's merchandising business in these cities will, at the very least, hold its own, and in some of them it will probably grow to amount to 40 per cent of the total. To perhaps a smaller extent, this also applies to the towns in Group C, where central-station executives are putting forth more energetic sales efforts. In Group B the volume of central-station sales is virtually nil, although in city VII the two companies recognize the necessity of pioneering electric ranges and water heaters, while in city VI the dealers, both electrical and non-electrical, say that no development work is being done on pioneering devices.

CHANGING TREND

In the course of the investigation it was everywhere apparent that the appliance business is in a period of transition, and it is still in a state of flux. Though the electrical industry is young, it has acquired an amazing popularity with the public, and there is an ever-increasing demand to do things electrically. It has attracted to itself in the retailing of household devices many storekeepers of little experience who thought they saw an opportunity in a virgin field. Unlike the hardware, department or grocery store, the electrical appliance business has no tradition for the new merchant to follow, and consequently he has had to pay the price of all pioneers by stumbling into pitfalls that no one knew existed. From his experience other dealers can and do now profit. The fact that appliance sales appear to be settling into certain definite retail channels indicate that the business is becoming more stabilized, and as it does more will be known of what it costs to sell, how certain devices must be marketed and to what extent electrical appliances can be depended upon as the major source of income.

One of the outstanding problems which remain to be settled is the question of discount, particularly to the small dealer. He complains, not without cause from his viewpoint, that it is impossible to make a profit of 25 to 30 per cent, when he finds his non-electrical competitors, chiefly the hardware and department stores, selling flatirons, say, at a cut price which is just about what the dealer has to pay the jobber for the appliance. Large buyers, such as the department stores, go direct to the manufacturer and, basing their demand on their buying power, obtain the jobbers' discount.

There are also some manufacturers who are selling direct to the small non-electrical dealers at dis-

Recapitulation of Annual Electrical Appliance Sales by Kinds of Dea

Class of Dealer	Group A, Five cities where central station companies merchandise appliances									
	City I Middle West	Per Cent	City II Middle West	Per Cent	City III Middle West	Per Cent	City IV Western	Per Cent	City V Eastern	Per Ce
Location										
Population, U. S. Census, 1920*	500,000	.....	200,000	.....	800,000	.....	250,000	.....	800,000	.....
Estimated population served*	600,000	.....	250,000	.....	1,000,000	.....	250,000	.....	1,450,000	.....
Non-Electrical:										
Hardware	$105,824	7.6	$2,013	0.3	$15,462	0.8	$14,697	3.4	$7,399	0
Sporting goods	.....	.....	.....	.....	.....	.....	.....	.....	4,903	0
Department	115,380	8.4	182,465	24.8	526,387	28.5	119,312	29.0	463,834	29
Housefurnishing	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Furniture	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	$221,204	16.0	$184,478	25.1	$541,849	29.3	$134,009	32.4	$476,136	29
Electrical:										
Contractor-Dealers	$92,743	6.8	$82,949	11.2	$107,134	6.2	$76,203	17.8	$161,256	10
Electric Shops	195,743	14.3	123,262	16.7	126,352	6.8	.....	.....	29,246	1
Specialty	429,216	31.4	119,003	16.3	436,243	23.7	37,741	8.6	290,375	18
Central Station	432,771	31.5	226,575	30.7	627,875	34.0	169,694	41.2	635,948	40
	$1,150,473	84.0	$551,789	74.9	$1,297,604	70.7	$283,638	67.6	$1,116,825	70
Total	$1,371,677	100.0	$736,267	100.0	$1,839,453	100.0	$417,647	100.0	$1,592,961	100
Sales per capita on seven appliances based on population served	$2.29	.....	$2.95	.....	$1.83	.....	$1.67	.....	$1.10	.....

* U. S. Census gives population only within corporate limits of the cities, while the estimated population served includes those people residing in contiguous terri

counts much better than the electrical jobber can or will give to small electrical dealers. Hardware stores desire discounts of 35 to 40 per cent, but on a few electrical lines they are grudgingly accepting as low as 30 and 33 per cent. Department stores demand, and claim that they usually get 40 to 45 per cent on staple merchandise. It is this extra discount that enables them so often to reduce prices and allows them to feature appliances as leaders or specials. On style devices, such as portable lamps, which deteriorate rapidly and which may be slow movers, at least 50 per cent is required.

HOUSE-TO-HOUSE SALESMEN

The higher-priced appliances require high-pressure selling by outside crews, and between 90 and 95 per cent of these appliances are sold in this manner. It is a constant problem with all classes of dealers to find the right men for this work. Advertisements for salesmen attract a miscellaneous assortment of applicants varying from former bartenders to experienced specialty salesmen out of luck, with some fairly well-educated young men having no selling experience to leaven the mixture. To train and hold these men together is most difficult. A few manufacturers of washing machines and vacuum cleaners have been successful in obtaining men of generally high caliber, who are used mostly for resale work, with either the central-station company or the department store. As a rule, the turnover of these men is high—300 per cent annually in some cases. This method of selling the larger devices appears to be a permanent plan, and it can only be hoped that the central-station companies and the more responsible manufacturers will be able to develop a generally higher class of men for this work. Manufacturers are convinced that they must lend some selling assistance to the local dealers, and they appear to be doing the best within their power.

OUTSTANDING CONCLUSIONS

Based on observations of conditions in the cities investigated and statements by individual dealers themselves, together with the tabulation showing the distribution of retail sales, some definite conclusions may be drawn. It is difficult and dangerous, of course, to endeavor to predict absolutely what may happen. It is fully realized that a prophet is without honor in his own country, and in printing the following statement attention is again called to the fact that the investigation has had certain limitations in its scope and must be judged accordingly. With these things in mind, the following salient features stand out:

1. In those cities where the central-station companies sell appliances they are the largest single retail outlets. They are stable and consistent merchandisers and can hold their present position as leaders indefinitely if they so desire. There is a marked tendency among them to merchandise for profit, with energy consumption as a secondary consideration. They can and do exert a strong influence among all other dealers in controlling the standard of appliances through co-operation with electrical dealers. Their practices in merchandising are more considerate of the electrical contractor-dealers than are the special sales and leaders advertised by department and hardware stores, which do not complain of unfair competition. The central-station company is the only agency that can and will assume the responsibility for pioneering new devices. All other retail dealers look to it to do this work.

2. Contractor-dealers, while not fading out of the picture as retail merchandisers, apparently are becoming relatively a less important factor, at least in the larger cities. Some of them have retired from the appliance business to devote their attention to wiring, fixtures and general contracting work. Incandescent lamp sales with many contractor-dealers are their most important items of merchandise, except in a city where the central station has a free lamp-renewal policy in effect. Under such conditions contractor-dealers find that all over-the-counter sales are lessened. While at the present time many contractors are indifferent to appliance sales, they have it in their power to remain in a strategic position, to become a stronger factor in merchandising at times when contracting and wiring suffer a slump, as when there is a lull in building activities.

3. Specialty stores appear to have passed the peak of their activity because of the fact that a number of manufacturers have closed their branch stores and are finding outlets through established dealers. These stores are not being replaced to a great extent by privately owned specialty stores, although those now in business may be expected to remain. When this class of store was at the height of its success, a year and a half ago, the success of a few led many others into the experiment, and there were a number of casualties, due largely to ill-advised extension of credit and lack of man power. Only when the privately owned specialty store is well financed, well managed and well equipped with a sales crew can it survive.

4. Electric shops, selling over the counter exclusively, are succeeding only when conducted on the best merchandising basis. A large population is necessary to support one such store in a community. Contributing or related lines of merchandise are most desirable, if not essential. Fixtures, portable lamps and, most important of all, radio equipment have been the salvation of these stores.

5. Department stores have shown the most rapid increase in appliance sales and probably will be the most active rivals of the central-station company.

in Cities Studied

	Group B, Two cities where central stations do no merchandising				Group C, Four small cities where central stations merchandise			
	City VI		City VII Pacific Coast		Central & Eastern		Total	
	Central	Per Cent		Per Cent		Per Cent		Per Cent
	800,000	.....	600,000	.....	95,000	.....	4,045,000	.....
	1,100,000	.....	1,250,000	.....	100,000	.....	6,000,000	.....
	379,730	2.5	$135,961	8.6	$18,347	7.4	$378,419	3.50
	.....	.....	.....	.....	.....	.....	4,903	0.03
	994,787	31.8	223,950	14.2	36,505	14.5	2,662,620	24.50
	112,963	3.6	325,961	20.6	.....	.....	446,686	4.10
	.....	.....	26,609	1.6	7,762	3.1	26,609	0.07
	1,18,480	47.9	$712,481	45.0	$62,614	25.0	$3,519,237	32.2
	109,023	3.5	$52,930	3.5	76,083	31.2	$759,331	6.90
	332,078	10.6	208,848	13.2	28,750	11.6	1,044,273	9.70
	500,231	48.0	541,187	34.3	15,650	6.3	3,369,646	30.80
	.....	.....	63,120	4.0	63,994	25.9	2,219,977	20.40
	941,332	52.1	866,085	55.0	184,477	75.0	7,393,227	67.80
	128,812	100.0	$1,578,577	100.0	$247,091	100.0	$10,912,464	10.00
	$2.84	.....	$1.26	.....	$2.47	.....	$1.82	.....

which may be considered as tributary to the dealers in the cities under consideration.

Group "A"—Sales of Principal Electrical Appliances in Five Cities of 200,000 to 800,000 Population Where the Central-Station Companies Are Active Merchandisers

Kind and Number of Dealers	Washing Machines	Vacuum Cleaners	Ironers	Flatirons	Curling Irons	Toasters	Percolators	Ranges	Total Sales Each Class of Store and per Cent of Total All Cities	Per Cent of Dealers' Sales Each City
Hardware Stores:										
City I—2	730	20	.....	550	825	430	186	12	$105,824	7.6
City II—2	5	.....	.....	100	55	42	27	.....	2,013	0.3
City III—2	30	25	.....	625	425	225	274	.....	15,462	0.8
City IV—4	28	40	.....	775	335	168	161	.....	14,697	3.4
City V—3	.....	43	.....	450	182	134	72	.....	7,399	0.4
Total (13 stores)	793	128	.....	2,500	1,822	999	720	12		
Value	$99,100	$6,720	.....	$15,000	$8,151	$5,994	$8,660	$1,800	$145,395	
Per cent of appliance sales	68.2	4.6	.....	10.3	5.6	4.2	5.9	1.2		
Per cent of sales this appliance	3.4	0.3	.....	3.4	7.3	5.7	8.1	1.9	2.5	
Sporting Goods Stores:										
City V—3	.....	.....	.....	400	188	158	63	.....	$4,903	0.3
Value	.....	.....	.....	$2,400	$799	$948	$756	.....		
Per cent of appliance sales	.....	.....	.....	48.8	16.3	19.4	15.5	.....		
Per cent of sales this appliance	.....	.....	.....	0.5	0.7	0.9	0.7	.....	0.001	
Department Stores:										
City I—3	356	512	.....	2,075	1,500	675	480	100	115,380	8.4
City II—2	975	650	10	1,800	1,750	325	370	.....	182,465	24.8
City III—3	2,375	2,825	200	3,700	2,900	1,125	775	.....	526,387	28.5
City IV—4	236	1,325	.....	1,300	1,400	370	235	.....	119,312	29.0
City V—4	900	5,350	35	4,300	3,675	1,875	795	.....	463,834	29.0
Total (16 stores)	4,842	10,662	245	13,175	11,225	4,370	2,655	100		
Value	$605,150	$559,644	$36,750	$79,050	$49,594	$30,330	$31,860	$15,000	$1,407,378	
Per cent of appliance sales	42.8	39.7	2.6	5.7	3.6	2.2	2.3	1.1		
Per cent of sales this appliance	20.8	27.8	18.4	18.0	45.0	28.7	29.9	15.8	23.7	
Contractor-Dealers:										
City I—15	469	163	.....	715	500	295	198	100	$92,743	6.8
City II—6	383	325	.....	1,385	946	623	162	.....	82,949	11.2
City III—10	425	440	18	2,150	875	655	261	.....	107,134	6.2
City IV—10	167	537	.....	1,400	1,380	454	384	.....	76,213	17.8
City V—19	598	1,013	6	2,736	1,145	1,073	392	.....	162,256	10.1
Total (60 stores)	2,142	2,478	24	8,386	4,746	3,100	1,397	100		
Value	$266,750	$130,095	$3,600	$50,316	$20,170	$18,600	$16,764	$15,000	$521,295	
Per cent of appliance sales	51.2	25.0	0.7	9.6	3.8	3.6	3.2	2.9		
Per cent of sales this appliance	9.3	6.5	1.7	11.3	18.1	17.7	15.7	15.8	8.8	
Electrical Stores:										
City I—3	1,025	1,125	20	650	525	348	153	10	$195,743	14.3
City II—1	650	350	100	600	550	350	50	.....	123,262	16.7
City III—2	600	500	45	1,250	1,050	525	270	.....	126,352	6.8
City IV	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
City V—2	80	150	.....	825	500	425	145	.....	29,240	1.8
Total (8 stores)	2,355	2,125	165	2,325	2,625	1,648	618	10		
Value	294,375	$111,562	$24,750	$13,950	$11,156	$9,888	$7,416	$1,500	$474,597	
Per cent of appliance sales	62.1	23.5	5.2	2.9	2.3	2.1	1.6	0.3		
Per cent of sales this appliance	10.4	5.4	12.3	3.6	10.0	9.4	6.9	1.5	7.9	
Specialty Stores:										
City I—5	1,425	4,465	87	130	100	54	25	12	$429,216	31.4
City II—3	750	355	25	155	159	96	57	.....	119,003	16.3
City III—5	2,000	3,300	110	550	225	175	100	.....	426,243	23.7
City IV—1	150	275	18	100	75	60	48	.....	37,741	8.6
City V—6	1,525	1,500	140	.....	.....	.....	.....	.....	290,375	18.3
Total (20 stores)	5,850	9,895	380	935	559	385	230	12		
Value	$731,250	$509,487	$57,000	$5,610	$2,351	$2,320	$2,760	$1,800	$1,312,578	
Per cent of appliance sales	55.8	38.8	4.3	0.4	0.2	0.2	0.2	0.1		
Per cent of sales this appliance	25.4	25.2	28.1	1.1	2.1	2.2	2.6	1.9	21.9	
Central-Station Companies:										
City I—1	1,200	3,000	80	7,500	650	313	289	400	$432,771	31.5
City II—1	1,125	950	100	1,650	750	700	300	.....	226,575	30.7
City III—1	2,325	3,300	225	20,100	1,100	1,120	665	.....	627,875	34.0
City IV—1	409	1,378	61	2,754	500	1,100	975	.....	169,694	41.2
City V—4	2,019	4,909	67	13,489	1,220	2,997	975	.....	635,948	40.1
Total (8 companies)	7,078	13,537	533	45,493	4,220	6,230	3,204	400		
Value	$884,750	$700,692	$79,950	$272,958	$18,685	$37,380	$38,448	$60,000	$2,092,863	
Per cent of appliance sales	42.3	33.5	3.8	13.0	0.9	1.8	1.8	2.9		
Per cent of sales this appliance	30.7	34.8	29.5	62.1	16.8	35.4	36.1	63.1	35.2	
Grand Total:										
All dealers	23,060	38,025	1,347	73,214	25,385	16,890	8,887	634		
Value	$2,881,375	$2,018,200	$202,050	$439,284	$110,906	$105,460	$106,664	$95,100	$5,959,009	
Per cent of total sales	48.4	33.8	3.4	7.4	1.9	1.7	1.8	1.6	100.0	

Their sales are now tending to level off, and increases will more nearly reflect natural growth. Working with manufacturers on resale plans for the heavier appliances has been the biggest factor in accounting for this phenomenal growth.

6. Hardware stores are well adapted to carry electrical merchandise and may be expected to show a steady but moderate increase in sales of stable appliances. Taken the country over, they will probably not be an important factor in the sales of larger devices. They are, however, assuming more importance in incandescent-lamp sales, and this will tend to increase their business on electrical appliances.

7. The activity of both department and hardware stores in accepting electrical merchandise indicates the stability and permanence of public demand for appliances, for neither class of store can afford to experiment with unproved lines. It has also been observed that there is a strong natural tendency on the part of the public to buy staple lines from these stores in preference to patronizing a specialized store.

8. Some sub-standard appliances right now are dis-

Group "B"—Sales of Principal Electrical Appliances in Two Cities, of 800,000 and 600,000 Population Where the Central-Station Companies Do Not Sell Appliances

Kind and Number of Dealers	Washing Machines	Vacuum Cleaners	Ironers	Flatirons	Curling Irons	Toasters	Percolators	Ranges	Total Sales Each Class of Store and per Cent of Total All Cities	Per Cent of Dealers' Sales Each City
Hardware Stores:										
City VI—10	.....	.....	.....	6,750	5,450	1,190	620	.....	$79,730	2.5
City VII—20	250	809	13	3,611	3,236	1,281	694	12	135,961	8.6
Total (30 stores)	250	809	13	10,361	8,686	2,471	1,314	12		
Value	$38,500	$48,540	$2,305	$58,990	$30,420	$15,869	$17,953	$2,100	$214,677	
Per cent of appliance sales	18.0	22.5	1.1	27.4	14.4	7.4	8.3	0.9	.....	
Per cent of sales this appliance	1.5	3.4	1.4	26.5	20.9	17.2	17.6	3.2	4.5	
Contractor-Dealers:										
City VI—26	490	477	44	1,218	974	406	167	.....	$109,023	3.5
City VII—18	87	220	1	2,451	2,086	613	289	.....	52,930	3.4
Total (44 stores)	577	697	45	3,669	3,060	1,019	456	.....		
Value	$74,380	$38,892	$6,777	$20,908	$9,608	$5,946	$5,442	.....	$161,953	
Per cent of appliance sales	45.9	24.1	4.2	12.9	5.9	3.7	3.3	.....	.....	
Per cent of sales this appliance	2.9	2.8	4.1	9.4	6.7	6.4	5.3	.....	3.4	
Electric Shops:										
City VI—5	1,950	635	150	2,410	1,911	830	371	.....	$332,078	10.6
City VII—9	386	1,664	12	3,207	3,700	1,723	554	.....	208,848	13.3
Total (14 stores)	2,336	3,299	162	5,617	5,611	2,553	925	.....		
Value	$302,050	$138,337	$24,630	$32,210	$17,837	$14,730	$11,032	.....	$540,926	
Per cent of appliance sales	55.7	25.7	4.6	5.9	3.4	2.7	2.0	.....	.....	
Per cent of sales this appliance	12.3	9.6	14.8	14.5	12.3	16.0	10.7	.....	11.4	
Specialty Stores:										
City VI—9	8,581	6,490	568	125	55	48	33	.....	$1,500,231	48.0
City VII—8	1,405	4,822	130	173	150	57	26	.....	541,187	34.3
Total	9,986	11,312	698	298	205	105	59	.....		
Value	$1,285,015	$644,505	$108,268	$1,692	$622	$606	$710	.....	$2,041,418	
Per cent of appliance sales	62.9	31.6	5.3	0.01	0.003	0.003	0.003	.....	.....	
Per cent of sales this appliance	51.8	45.0	65.3	0.80	0.400	0.600	0.700	.....	43.2	
Department Stores:										
City VI—5	4,100	6,175	48	10,700	11,800	3,150	1,225	.....	$994,787	31.8
City VII—5	150	1,525	10	4,050	13,750	3,200	2,225	.....	223,950	14.2
Total (10 stores)	4,250	8,700	58	14,750	25,550	6,350	3,450	.....		
Value	$535,000	$427,187	$9,000	$87,375	$82,400	$36,450	$41,325	.....	$1,218,737	
Per cent of appliance sales	44.2	35.2	0.8	7.3	6.9	2.2	3.4	.....	.....	
Per cent of sales this appliance	21.6	29.9	5.4	39.2	56.7	39.6	40.5	.....	26.5	
Housefurnishing Stores:										
City VI—2	450	825	27	850	150	350	123	.....	$112,963	3.6
City VII—4	1,152	1,310	62	2,425	1,056	2,840	1,595	.....	325,961	20.6
Total (6 stores)	1,602	2,135	89	3,275	1,206	3,190	1,718	.....		
Value	$837,530	$121,937	$14,960	$18,800	$4,315	$17,631	$23,751	.....	$438,924	
Per cent of appliance sales	54.1	27.8	3.4	4.3	0.9	4.1	5.4	.....	.....	
Per cent of sales this appliance	9.5	8.5	9.0	8.4	2.9	19.2	23.3	.....	9.2	
Furniture Stores:										
City VII—4	60	185	.....	450	24	124	149	4		
Value	$9,000	$11,100	.....	$2,625	$120	$930	$2,134	$700	$26,609	1.6
Per cent of appliance sales	33.8	41.7	.....	10.0	0.5	3.5	8.0	2.5	.....	
Per cent of sales this appliance	0.4	0.8	.....	1.2	0.01	1.0	1.9	1.0	0.5	
Central-Station Company:										
City VI (does not sell appliances)	.....	.....	.....	.....	.....	.....	.....	.....		
City VII (sells ranges, water heaters, etc.)	.....	.....	.....	.....	.....	.....	.....	357	$63,120	4.0
Value	.....	.....	.....	.....	.....	.....	.....	$63,120	.....	
Per cent of appliance sales	.....	.....	.....	.....	.....	.....	.....	100	.....	
Per cent of sales this appliance	.....	.....	.....	.....	.....	.....	.....	.....	1.3	
Grand Total	19,061	25,137	1,055	38,420	44,342	15,812	8,071	373		
Total value	$2,481,475	$1,430,498	$165,940	$222,600	$145,322	$92,262	$101,347	$65,920	$4,706,364	
Per cent of total sales	52.9	30.4	3.5	4.7	3.1	1.9	2.1	1.4	100.0	

turbing the confidence of the buying public. Most of these are being sold by non-electrical dealers, principally as leaders or "specials." However, a similar condition exists in other businesses, and the public soon learns by experience to detect faulty goods. It should be remembered that some people seem to prefer an inferior device at a low price.

9. There is a strong tendency on the part of department and hardware stores to buy direct from the manufacturers because of better discounts. As a whole, department stores are satisfied with the discounts thus obtained, but the contractor-dealer declares that this is not fair competition.

10. For a retail electrical dealer to boycott manufacturers or jobbers who sell to non-electrical dealers is an unsound method of trying to control the retail market. In cities where it is practiced it was found only to open the way to greater sales of inferior merchandise. When a public demand exists for electrical appliances many non-electrical stores will buy inferior appliances instead of a standard line.

11. All the higher-priced appliances must be "sold." There are few voluntary purchases that have not been stimulated either by salesmen or advertising, and the high turnover of salesmen, due to the low standard of men naturally attracted to this sort of work, has had a serious effect in lessening sales. Higher caliber salesmen should be developed.

12. Greater responsibility must be assumed by manufacturers in promoting retail sales through co-operative advertising with electrical dealers and the education and training of salesmen.

13. Sales of the larger appliances—washing machines, vacuum cleaners, etc.—represent between 80 and

Group "C"—Sales of Principal Electrical Appliances in Four Small Cities and Towns of 10,000 to 30,000 Population

Kind and Number of Dealers	Washing Machines	Vacuum Cleaners	Ironers	Flatirons	Cruling Irons	Toasters	Percolators	Total Sales Each Class of Store and per Cent of Total All Cities	Per Cent, Dealers' Sales Each City
Hardware Stores:									
Town "M"—2	45	.....	.....	192	66	76	32	$7,897	11.8
Town "N"—1	.....	.....	.....	144	35	48	18	1,521	2.2
Town "H"—2	36	40	.....	188	73	42	28	8,626	9.4
Town "C"—1	.....	.....	.....	56	12	6	.....	303	2.1
Total (6 stores)	81	40	.....	560	187	172	78		
Value	$10,125	$2,100	.....	$3,360	$794	$1,032	$936	$18,347	
Per cent of appliance sales	55.1	11.4	.....	18.4	4.4	5.6	5.1	7.4	
Per cent of sales this appliance	7.8	2.7	.....	13.4	13.7	15.2	22.2		
Electrical Stores:									
Town "H"—1	150	100	.....	450	200	150	25		
Value	$18,750	$5,250	.....	$2,700	$850	$900	$300	$28,750	31.3
Per cent of appliance sales	65.2	18.3	.....	9.3	2.8	3.1	1.3	11.6	
Per cent of sales this appliance	14.5	6.8	.....	12.1	14.8	13.4	7.1		
Contractor-Dealers:									
Town "M"—3	60	75	.....	196	74	93	28	$13,767	20.6
Town "N"—5	172	214	.....	259	90	130	52	36,135	47.9
Town "H"—5	91	141	.....	36	15	10	3	23,635	25.7
Town "C"—2	10	13	.....	54	23	16	8	2,546	17.4
Total (15 stores)	333	443	.....	545	202	250	91		
Value	$41,625	$23,256	.....	$6,660	$1,742	$2,035	$1,548	$76,083	
Per cent of appliance sales	54.8	30.6	.....	7.9	2.0	2.7	2.0	31.2	
Per cent of sales this appliance	32.2	30.0	.....	26.9	26.6	30.3	36.7		
Specialty Stores:									
Town "M"—1	100	60	.....	.....	.....	.....	.....		
Value	$12,500	$3,150	.....	.....	.....	.....	.....	$15,650	23.5
Per cent of appliance sales	79.9	20.1	.....	.....	.....	.....	.....	6.3	
Per cent of sales this appliance	9.7	4.0	.....	.....	.....	.....	.....		
Department Stores:									
Town "N"—2	43	60	.....	72	80	48	30	$10,570	14.4
Town "H"—2	38	350	.....	300	144	60	24	25,935	28.2
Total (4 stores)	81	410	.....	372	224	108	54		
Value	$10,500	$21,525	.....	$2,232	$952	$648	$648	$36,505	
Per cent of appliance sales	28.8	58.9	.....	6.1	2.6	1.8	1.8	14.6	
Per cent of sales this appliance	8.2	27.7	.....	9.9	16.5	9.6	15.5		
Furniture Stores:									
Town "M"—3	24	45	.....	400	.....	.....	.....		
Value	$3,000	$2,362	.....	$2,400	.....	.....	.....	$7,762	11.6
Per cent of appliance sales	38.6	30.4	.....	31.0	.....	.....	.....	3.1	
Per cent of sales this appliance	2.3	3.0	.....	10.1	.....	.....	.....		
Central-Station Companies:									
Town "M"—1	36	230	2	300	300	225	30	21,660	32.5
Town "N"—1	154	79	3	284	25	58	11	26,137	35.6
Town "H"—1	15	24	.....	150	36	48	12	4,620	5.4
Town "C"—1	47	48	3	223	25	24	12	11,577	80.5
Total (4 stores)	252	381	8	957	386	355	65		
Value	$2,500	$20,002	$1,200	$5,742	$1,640	$2,130	$780	$63,994	
Per cent of appliance sales	50.8	31.2	1.9	9.0	2.6	3.3	1.2	25.9	
Per cent of sales this appliance	25.3	25.8	100.0	25.6	28.4	31.5	18.5		
Grand Total	$129,000	$77,645	$1,200	$22,494	$5,778	$6,762	$4,212	$247,091	
Per cent of appliance sales	52.3	31.4	0.5	9.1	2.3	2.7	1.7	100.0	

85 per cent of the money value of the appliances sold, varying slightly in different cities. This does not include radio, fixtures, portable lamps or incandescent lamps. Sales of many of the energy-consuming appliances other than the flatiron are very small compared with other devices. Their low sales price makes them comparatively unattractive to some dealers, especially those depending on outside salesmen.

14. While there is a certain voluntary demand, sales are directly proportional to the efforts expended on any particular appliance. It was also observed that in those cities where the central-station company had engaged in an active merchandising policy at any time it had a distinct and lasting effect in increasing sales by all classes of dealers, and where the company is an active merchandiser sales by other dealers usually increase.

15. From the statements of all dealers interviewed, appliance sales in 1923 increased between 20 and 25 per cent over those of 1922. A part of this increase, of course, should be attributed to the generally better business conditions in 1923.

16. Based solely upon the sales by the different kinds of dealers in the five large cities where the central-station companies sell appliances, which in all probability most closely represent normal average conditions, the proportion of total sales is divided as follows: Hardware stores, 2.5 per cent; department stores, 23.7 per cent; contractor-dealers, 8.9 per cent; electrical stores, 7.9 per cent; specialty dealers, 21.9 per cent, and central-station companies, 35.2 per cent.

Tippecanoe River Development

ATTENTION has been called to the fact that the figures concerning the Norway development of the Indiana Hydro-Electric Company printed in Table IV, page 29, of the January 5 issue of the ELECTRICAL WORLD, where the plant was shown as having an initial development of 2,500 hp. and an ultimate capacity of more than 9,000 hp., were erroneous. This plant was put into operation early last summer and has its full capacity already installed, amounting to 9,000 hp. Plans for the second step of power development on the Tippecanoe River, which will have an installation of approximately 14,000 hp., are under way. It is hoped this part of the work will be undertaken and completed in 1924.

Letters from Our Readers

A Place Set Apart for Suggestions, Comments and Criticisms, to Which All Men of the Electrical Industry Are Cordially Invited to Contribute

Misleading Water-Power Data

To the Editors of the ELECTRICAL WORLD:

In your article headed "Coal-Field Superpower Group Formed" (ELECTRICAL WORLD, March 22, page 588) it is said that 500,000 hp. may eventually be produced on the Cheat River, at the Pennsylvania-West Virginia line, and that 400,000 hp. is the potential output from the Clarion River in Pennsylvania. On pages 65 and 66 of the Smithsonian Institution's "Study of Natural Resources Applied to Pennsylvania's Resources" it is shown that the average flow of the Clarion River will produce 42,000 kw. and that to get even this would require an enormous investment in storage capacity. In a report made by Colonel Keller, U.S.A., on "The Power Situation During the War" 36,000 kw. is given as the power derivable from the Cheat River development near the Pennsylvania state line—the one referred to in the news article in question.

Would it not be well for technical papers to be conservative in the figures they publish concerning water-power possibilities? Exaggerated statements that creep into their columns become the basis of wild public opinion and must ultimately result in a reaction against the electrical industry.

SAMUEL S. WYER,
Consulting Engineer.

Columbus, Ohio.

[Our correspondent's advocacy of conservative statement is, of course, unassailable. In reporting new water-power projects—that is, projects still in the guesswork stage—the ELECTRICAL WORLD quotes the figures of the promoters without, as a rule, casting doubt on their accuracy, since the context usually makes it clear that the editors are not vouching for them. When, later on, applications for preliminary permits are made to the Federal Power Commission the commission's engineers make a rough estimate from the data they have on hand and usually mark down the horsepower claimed by the applicants, although the engineers are fairly generous in their estimates. The figures quoted by the ELECTRICAL WORLD in the article in question, which were those given out by H. Hobart Porter, president of the American Waterworks & Electric Company, are substantially the same as those that originally came from the records of the Federal Power Commission. As regards the Clarion River it was then said: "The Clarion River is formed by the union of two branches 90 miles north of Foxburg and is fed by many other tributaries in its drop of 500 ft. to the Allegheny. Its total drainage area is 1,257 square miles, most of which is unsettled and unimproved forest land. When completed, the project will impound about 47,550,000,000 cu.ft. of water in the watershed of the Clarion River and its lower tributaries, a volume sufficient to develop 400,000 hp. of electrical energy." As regards the Cheat River the potential development on the entire river in both Pennsylvania and West Virginia—which was doubtless what Mr. Porter had in mind—was put at 600,000 hp.

The figures covering water-power developments in states such as Pennsylvania and Alabama appear high because this hydro power is used for a few hours a day only to carry peak loads. For instance, on the Clarion River development the first dam, the 75-ft. structure now under construction, can develop only 1,350 continuous horsepower. Nevertheless, machinery capable of generating 45,000 hp. is being installed with the idea that it will be used only for peak power. At the 225-ft. dam and the 150-ft. dam, which are to be built later, there will be the same policy of overinstallation. Exactly the same thing is contemplated on the Cheat River. There, however, there ultimately will be developed between 150,000 and 200,000 continuous horsepower. On one of the Alabama developments 110,000 hp. is being installed where 90 per cent of the time less than 20,000 hp. is available. It has been found to be very good practice, however, to hook this type of development into a steam-power system—EDITORS.]

Lenin's Ideas on the Electrification of Russia and Rural Service

To the Editors of the ELECTRICAL WORLD:

The last issue of the Russian electrical monthly, *Elektrichestvo*, has two editorials on the deep interest which the late Russian president of the Soviet of People's Commissaries, V. I. Lenin, had in the electrification of rural Russia. In view of the interest taken in this country in the similar problem of bringing electric power within the reach of the farmer, the following extracts may be of interest:

"Lenin understood the tremendous power which electricity can play in the national economy, and he transformed this idea from a narrow technical form into an ideal for peasants and workingmen. He tied it organically with the soviet power. We all remember how he once declared at a soviet congress that 'communism is soviet power plus electrification.'"

"Lenin was the first one in Russia to put the realization of a systematic electrification of the country on a practical business basis of routine state activity; he was the first one to demand that in all the schools of the soviet republic the plan of national electrification be made a required subject. He said: 'Let us organize in each electric power plant or in each district a local group of engineers and physicists, and with their assistance let teachers in every public school give popular talks on electrification, on electricity and on technical topics in general. Let us do this in a simple way to make it clear to every pupil and especially to young peasants.'"

V. KARAPETOFF.

Cornell University,
Ithaca, N. Y.

Defends Adequacy and Practicability of Glove-Testing Equipment

To the Editors of the ELECTRICAL WORLD:

In your issue of January 26 I have read Prof. G. F. Wittig's letter in regard to the glove-testing equipment described by me in the ELECTRICAL WORLD of January 12. I am, of course, aware that the connecting of five 2,200-volt transformers in series to give 10,000 volts subjects the insulation to a considerable overstrain. The transformers we used, however, were some we had on hand and had no particular use for. We mounted the five transformers on a wooden framework to insulate them to some degree from the ground.

I presume that this connection distorts the sine wave of voltage somewhat, so that it is more or less problematical just what puncturing voltage the gloves receive. This in no wise detracts from the efficiency of the device. We are not interested in laboratory accuracy.

The voltage, as described in my article, is measured by a voltmeter placed on the low-tension side of the transformer. Both the low-tension and the high-tension sides of the transformers are firmly grounded. The glove tester has never given any trouble. What we have been most concerned with is to make it a practicable foolproof contrivance, with no possibility of the operator receiving a dangerous shock.

E. E. NELSON,
General Superintendent.

Blackstone Valley Gas & Electric Company,
Pawtucket, R. I.

Central Station and Industrial Practice

Installation, Operation, Maintenance, Test and Repair of Generation and Distribution Equipment, and Methods of Economically Utilizing Electric Service in Large Industrial Plants

Salem Station Production Costs in 1923

OPERATING results from the tidewater steam plant of the Salem (Mass.) Electric Lighting Company for 1923, a 28,125-kva. station serving a number of communities north of Boston and interconnected with the Boston Edison, Malden, Revere and Beverly systems, are given herewith. The Salem plant operated six 750-hp. Bigelow-Hornsby boilers during the year, these units being equipped with eight-retort Taylor stokers, Foster superheaters and Sturtevant economizers. Four of these boilers were installed in 1916 and two in 1921, two additional units of the same size being under construction last year. The operating pressure was 200 lb., and the generating units, all 2,300-volt, three-phase, 60-cycle machines running 1,800 r.p.m. and of General Electric make, are rated, one at 3,125 kva., two at 7,812.5 kva. and one at 9,375 kva., the installation dates ranging from 1912 to 1921. One unit has a Westinghouse jet condenser, two have Le Blancs and one a Wheeler condenser.

The Salem plant has the reputation of being one of the most economical stations of its class in New England, and its annual operating costs are interesting as showing what can be done with a plant that is far from new, but which has been improved from time to time by careful engineering management and which is operated with a close watch upon load and equipment needs.

The average cost of coal per ton burned (62,102 tons bituminous) was $7.10, and the average fuel consumption per kilowatt-hour was 1.93 lb. The peak load of the year was 19,400 kw., and the average load was 8,250 kw. The annual load factor was 42.5 per cent. The total production cost per kilowatt-hour, exclusive of fixed charges, was 8.8 mills, and of this the fuel cost represented 6.13 mills, or 69.5 per cent, illustrating the continuing importance of coal cost in the central-station operating budget.

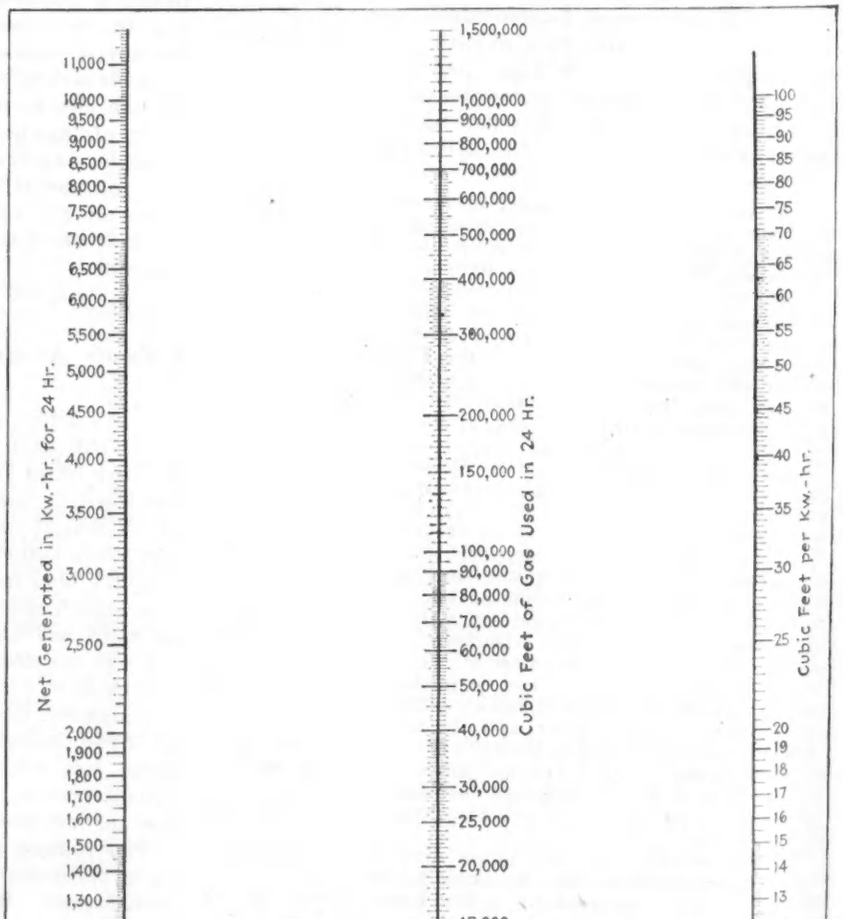
COSTS FOR OPERATING A 28,125-KVA. NEW ENGLAND PLANT

Production Expense		
Superintendence	$12,190	
Boiler labor	33,751	
Turbine labor	20,172	
Electrical labor	12,376	
Miscellaneous labor	4,832	
Boiler fuel	442,077	
Water for steam	26,607	
Lubricants	2,339	
Station supplies and expenses	10,832	
		$565,176
Maintenance Expense		
Station structures	$7,543	
Boiler-plant equipment	44,733	
Steam prime movers	10,195	
Electric generating equipment	4,278	
Miscellaneous power equipment	7,178	
		73,927
Total		$639,103
Deduction of certain credits from operation		2,856
Total production expense, net		$636,247

Chart for Determining Gas Used per Unit

BY J. H. PHILLIPS
Oklahoma City, Okla.

FOR plants generating power by means of fuel gas the accompanying chart should be of value in determining the cubic feet of gas



PERFORMANCE OF GAS PLANT QUICKLY CHECKED BY MEANS OF THIS CHART

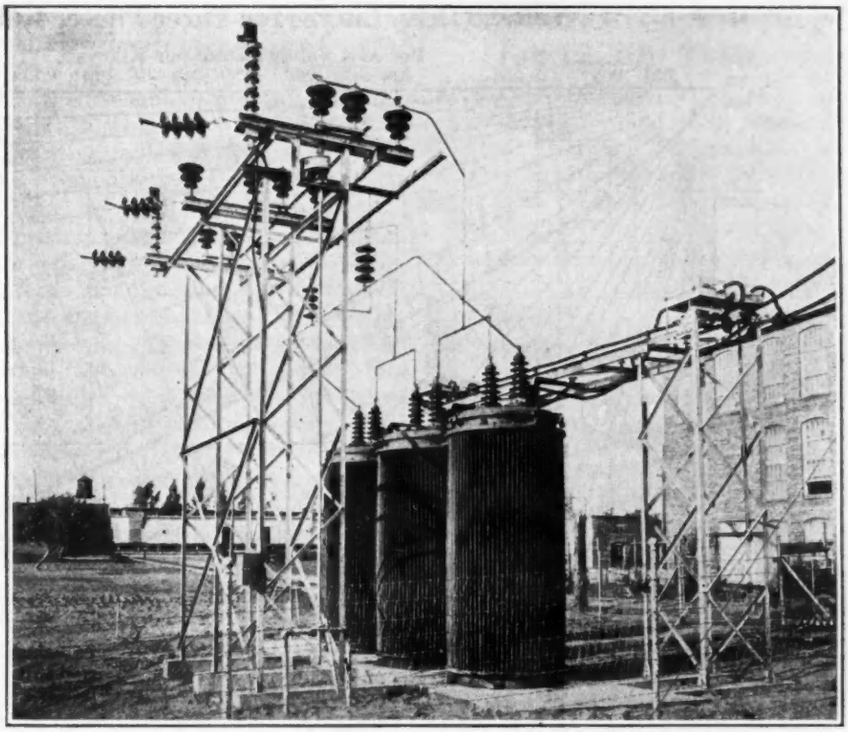
burned per kilowatt-hour. To use it, place a straight edge on the chart intersecting the value of gas consumed for a given shift, day, week or month and the value of kilowatt-hours output during the same respective period. The cubic feet of gas per kilowatt-hour is then read directly from the right-hand scale. For larger values than given on the chart the two left-hand scales must be multiplied by 10, 100 or 1,000.

A New-Type Outdoor Industrial Substation

THROUGH several years' developments the Southern Power Company has adopted a standardized outdoor substation for serving industrial customers which has proved very satisfactory. The station was designed to reduce installation costs, permit of standardization and increase in capacity and insure maximum service reliability at a minimum of maintenance expense.

Several types of substations were used previous to the present design and the pipe-framework type was its immediate predecessor. With pipes, however, installation costs were found to be greater because cutting and threading were necessary, and in addition rust on exposed surfaces and the necessity for frequent painting increased maintenance costs. The present design is standardized for installation up to 4,500 kva. on either 44,000-volt or 100,000-volt service. The station steel parts are all standardized and assembled and kept in warehouses ready to send to any job, and five or six men can install a station in four or five days at a total cost, exclusive of transformers, of about $700. The steel work and the concrete bases are standard for any kva. rating, and any station can be enlarged by substituting larger transformers and changing the low-tension wiring.

No arresters are used on the station, no fuses and no oil switches, and one of its most distinguishing features is the use of an automatic air-break switch. A series relay is mounted on top of a hollow insulator standard on the top of the steel framework. This actuates a rod extending down through the hollow standard, which makes a contact when an overload occurs whereby a local battery mounted in a box near the base of the structure actuates a solenoid trip coil on the air-break switch and opens the circuit.



A 44,000-VOLT, 1,200-KVA. INSTALLATION FOR A COTTON MILL

Through a mechanism operated by the lever at the base of the structure the electrician at the industrial plant is enabled to close the switch and re-energize the service. No fuses are used as they have been found unnecessary, and in addition this practice makes it easier and safer for industrial-plant attendants to operate the station. Through careful design a minimum weight of steel and number of insulators have been used on both the high-tension and low-tension substation structures.

Indoor-type instrument transformers are used on the low-tension side and are mounted on the top of the framework in metal boxes. The indoor types have been found best because of cheaper maintenance, and quicker repairs are possible than with the outdoor types. For metering a watt-hour meter is inclosed in a box and mounted near the base of the low-tension structure. No indicating meters are used, but the watt-hour meters are read daily by the local consumer and these readings sent to the power company headquarters on postal cards. In addition, monthly readings are taken for billing purposes. The daily records have proved valuable in keeping a continuous check on service conditions at each substation.

Many of these substations have been installed on the 44,000-volt system, one small town having twenty-one, and there are five in operation on the 100,000-volt lines.

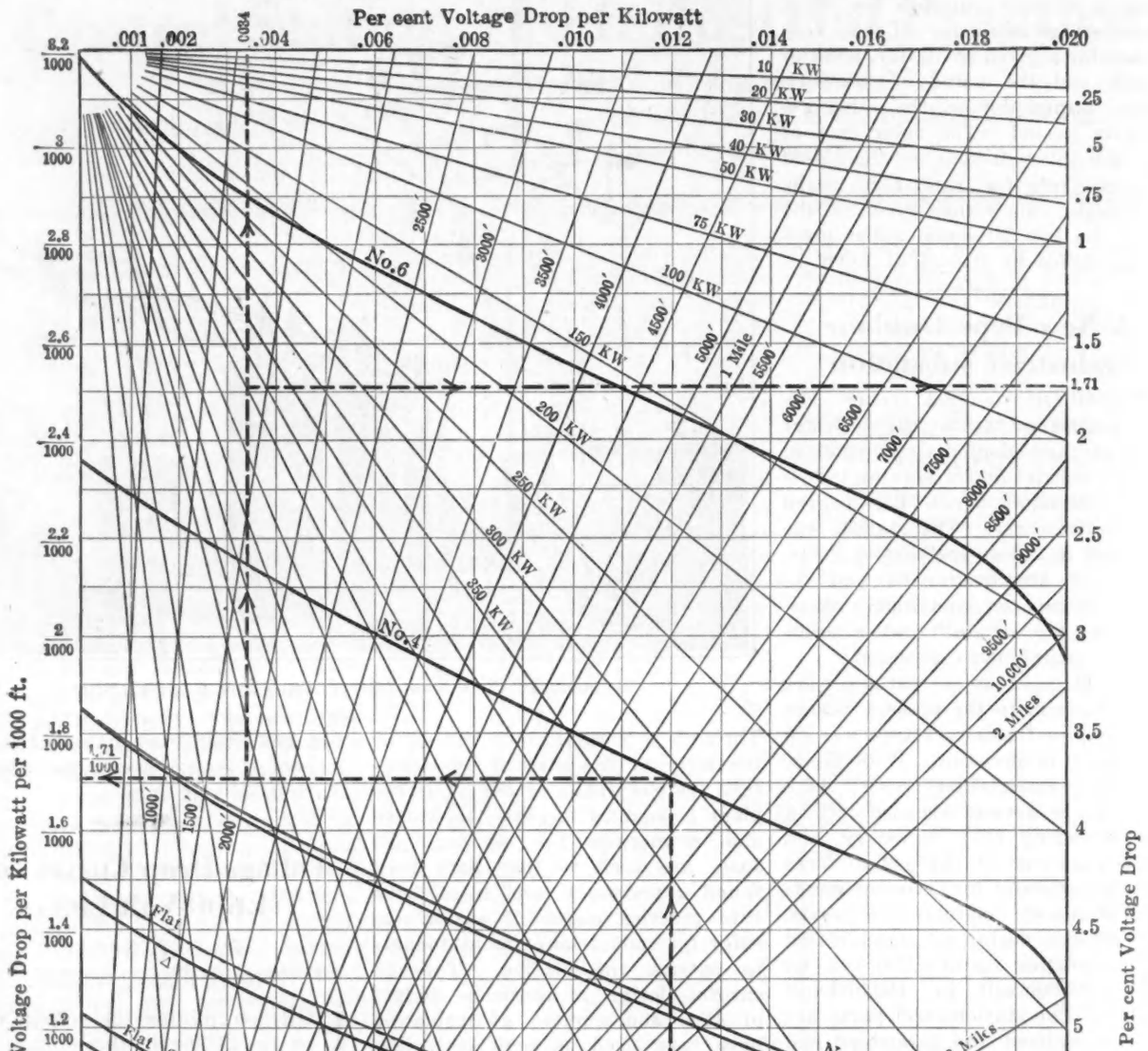
Voltage-Drop Curves for 4,600-Volt Lines

BY H. P. SEELYE
Assistant to Distribution Engineer Detroit Edison Company, Detroit

FOR determining the voltage drop on its 4,600-volt, three-phase distribution lines the Detroit Edison Company uses the chart shown on the following page. These curves apply only to three-phase lines with 4,600 volts at the receiver end. For any other voltage the voltage drop as given should be corrected by multiplying by the square of 4,600 divided by the actual voltage. For 4,400 volts this will increase the value about 9 per cent, and for 5,000 volts it will decrease the value about 15 per cent. For 230-volt secondaries multiply by 400. For single-phase lines, all other factors remaining the same, the voltage drop will be twice as large as for three-phase.

The curves are worked out for flat spacing (equivalent to 36 in.) and triangular spacing (equivalent to 27 in.). For small sizes of wire and for high power factors on the larger sizes there is little difference in the values. For low power factors on the larger sizes the difference is con-

Voltage Drop Curves for Three-Phase, 4,600-Volt Lines.



How to determine per cent voltage drop: Proceed vertically from power-factor scale to wire-size curve, then horizontally to line representing the total distance. Then proceed vertically to proper load line, and finally horizontally to "per cent voltage drop" scale at the right. This gives the per cent voltage drop for the case in hand.

siderable, as indicated by the double curves.

The voltage drop per unit length and unit load varies somewhat with the total value of voltage drop for the larger-sized wires and higher power factors, as indicated by the cross-sectioned area. For large total values of voltage drop (20 per cent) use the upper part of these cross-sectioned areas, while for low total values use the lower part.

Following is the typical example shown on the chart by the broken line:

Typical Example.—Power factor = 80 per cent; wire size = No. 4; distance = 2,000 ft.; load = 500 kw. What is the voltage drop?

Locate the power factor on the bottom scale and proceed vertically to its intersection with the curve for the wire size. The per cent voltage drop per kilowatt per 1,000 ft. may be found by proceeding horizontally to the scale on the left, which gives a value of 1.71/1000 per cent. The total voltage drop may be found by multiplying this by the distance in thousands of feet and the load in kilowatts; or

Voltage drop
$= 1.71 \div 1{,}000 \times 2 \times 500$
$= 1.71$ per cent.

This may be done graphically by proceeding horizontally from the intersection of the power-factor and wire-size lines to the diagonal for the distance. (The per cent voltage drop per kilowatt may be found by proceeding vertically from this point to the scale at the top, which gives 0.0034 per cent.) Proceed vertically from the distance line to the diagonal for the assumed load and then horizontally to the "per cent voltage drop" scale on the right, which gives 1.71 per cent.

Centralization of Stores and Control of Stock

ENGINEERS and operating men should be relieved of the responsibility of seeing that sufficient stocks of material are carried on hand, declares the purchasing agent of the Memphis Power & Light Company. It should be sufficient for them to notify the stores department when unusual requirements are to be met, and it should be the storekeeper's duty to keep adequate stock on hand without having too large an idle investment, he contends. Furthermore, the construction crews should not be kept waiting for material and supplies, nor should they have to travel too long a distance from the storeroom to the scene of their work, since both are productive of lost time and delayed construction.

To meet these requirements the Memphis Power & Light Company is planning to erect at a cost of $300,000 a central storehouse for the electric and gas systems it operates and the Memphis Street Railway, which it controls. To facilitate accounting it will be owned by one company and each system charged to cover the overhead and operating expense. The central storehouse, which will be in addition to smaller storehouses at the plants and car shops, will be built as near to the center of the territory served as possible to reduce the truck-miles. All stock will be stored in unit piles to facilitate inventories. Construction crews will be required to hand in each night requisitions for material needed the next day. A night force will fill the orders and have the material in boxes ready to be loaded on trucks as soon as the construction men arrive.

The amount of stock to be carried in each item will be such as to permit turnover every three months and thus minimize the idle investment therein. The withdrawals will be checked regularly to determine the amount of stock to carry. For articles which will have seasonal use this ratio will be modified. Stocks will never be allowed to drop below a minimum that will permit meeting thirty to sixty days' demands, depending on deliveries obtainable on the various items. This too will be checked regularly by keeping in close touch with trade conditions. Records will be kept of all withdrawals in such a way that the amount of stock on hand can be determined each day.

If the stockroom ever does run out of any article, which may happen occasionally because of unusual demands or unanticipated delays in deliveries, the operating or engineering department head who requires it most will be apprised of the fact. If he cannot wait for replenishment in the usual manner, the storekeeper will advise the purchasing agent to make rush replacement of the stock, by express if necessary.

While the proper ratio to gross earnings of the value of materials and supplies carried in stock and the cost of operating a storeroom per $1,000 of material disbursed have been determined by street railways to be 2.1 per cent to 12.35 per cent and $25 to $30 respectively, no similar figures are available for electric utilities, the Memphis Power & Light Company says, although such data would be very interesting for comparisons.

A Missouri River Crossing for 13,200 Volts

A NOTEWORTHY example of a transmission-line river crossing is shown in this photograph of a 1,320-ft. span over the Missouri River from Omaha, Neb., to Council Bluffs, Iowa. This 13,200-volt crossing was constructed by the Nebraska

CROSSING OVER MISSOURI RIVER WITH A SPAN OF 1,320 FT.

Power Company to replace the old cable crossing the Douglas Street Bridge. The new line was needed because vibration and expansion of the steel bridge had so weakened and aged the cable that continuity of service in the section fed was becoming endangered.

Three circuits of 336,400-circ.mil steel-reinforced aluminum conductors were then erected. Although the line is a quarter of a mile long, it clears the river by 55 ft. and its sag at the center is only 44 ft. The towers, weighing 35 tons, rest on foundations which have a mass of 350 tons.

A total of eight thousand feet of conductor was built into this crossing. Each cable has capacity alone to supply the 5,500-kw. load in Council Bluffs, but the third circuit is held in reserve.

Overhead Distribution Construction

Standardized Practice as Developed and Used by the
WEST PENN POWER COMPANY, PITTSBURGH

Fuse Cut-outs, Arresters and Transformer Numbering

Fuse Cut-outs.—On 2,300-volt circuits up to fuse ratings of 40 amp. plug-type fuse cut-outs shall be used. For fuse ratings of 40 amp. to 100 amp., 100 amp. expulsion-type fuse cut-outs shall be used. For fuse ratings of 100 amp. to 200 amp., 200 amp. expulsion-type fuse cut-outs shall be used.

On 2,300-volt and 6,900-volt transformer installations a cut-out shall be placed in the tap to each line wire and each cut-out shall be fused. On 4,000-volt circuits up to fuse ratings of 40 amp. plug-type fuse cut-outs shall be used. For fuse ratings of 40 amp. to 100 amp., 100 amp. expulsion-type fuse cut-outs shall be used. For fuse ratings of 100 amp. to 200 amp., 200-amp. expulsion-type fuse cut-outs shall be used.

On 4,000-volt transformer installations a cut-out shall be placed in the tap to each phase wire and each cut-out shall be fused. No cut-out shall be placed in the neutral wire at any point. On 6,900-volt circuits up to fuse ratings of 100 amp. the 100-amp. expulsion-type fuse cut-out shall be used. For ratings of 100 amp. to 200 amp., 200-amp. expulsion-type fuse cut-outs shall be used.

Primary cut-outs shall be attached to the cross-arm by ⅝-in. by 8-in. galvanized bolts. Standard lead, copper or aluminum fuse wire shall be used in the plug-type cut-outs. Standard-link fuses shall always be used in the expulsion-type fuse cut-outs containing link holders. Primary fuse sizes shall be determined from Table XIII (see ELECTRICAL WORLD for April 12, 1924, page 727).

Lightning Arresters.—For 2,300-volt circuits 2,300-volt compression-chamber lightning arresters shall be used. For the phase wires of 4,000-volt circuits 2,300-volt compression-chamber lightning arresters shall be used, and a 300-volt compression-chamber lightning arrester shall be used in the neutral wire of 4,000-volt circuits. For important 6,900-volt circuits 6,900-volt compression-chamber lightning arresters shall be used.

Numbering.—All distribution transformers shall be numbered. Number plates shall be permanently attached to all transformers by means of ⅝-in. No. 14 escutcheon pins driven into a hole made by a No. 45 drill. In case the ⅝-in. escutcheon pin fails to take a firm hold, a ¾-in. escutcheon pin can be used and riveted on the inside. The location of these plates must be just below the cover on the exterior of the transformer, as near to the manufacturer's nameplate as possible, but in all cases above the oil level.

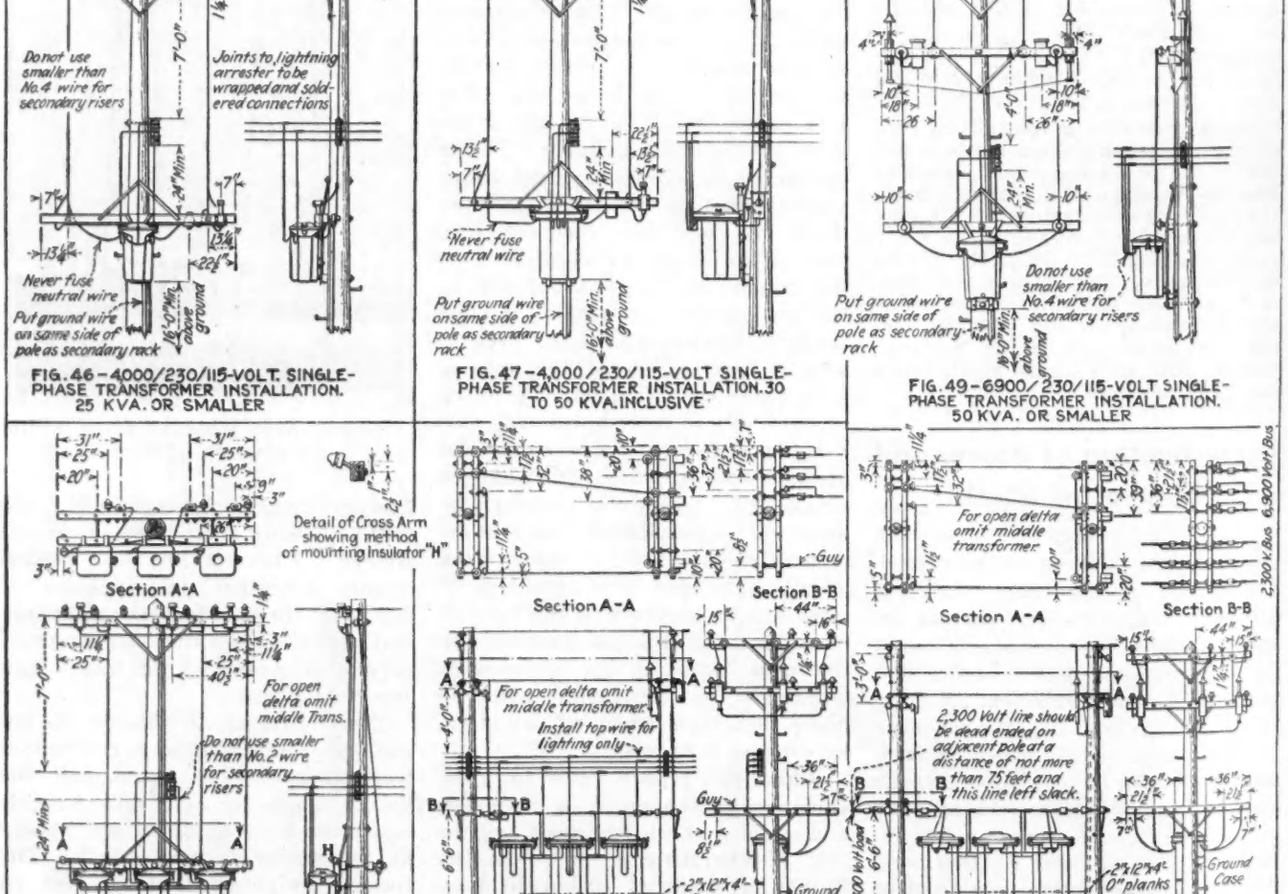

A N B C
Do not use smaller than No.4 wire for secondary risers
Joints to lightning arrester to be wrapped and soldered connections
7'-0"
24" Min.
Never fuse neutral wire
Put ground wire on same side of pole as secondary rack
16'-0" Min. above ground
Never fuse neutral wire
Put ground wire on same side of pole as secondary rack
16'-0" Min. above ground
Do not use smaller than No.4 wire for secondary risers
Put ground wire on same side of pole as secondary rack
16'-0" Min. above ground
Detail of Cross Arm showing method of mounting Insulator "H"
Section A-A
Do not use smaller than No.2 wire for secondary risers
For open delta omit middle Trans.
Put ground wire on same side of pole as secocondary rack
Run neutral to transformer pole but do not connect
Guy
Section A-A
Section B-B
For open delta omit middle transformer
Install top wire for lighting only
Ground Case
2"x12"x4'-0" planks spiked to beams
4 Beams 2"x12"x13'-0"
Two ⅝" through bolts
Spacer block of beam material placed at 5' center
12'
At least 40' poles are required for this installation
For open delta omit middle transformer
2,300 Volt line should be dead ended on adjacent pole at a distance of not more than 75 feet and this line left slack.
2,300 Volt Bus
6,900 Volt Bus
Ground Case
2"x12"x4'-0" planks spiked to beams
4 Beams 2"x12"x13'-0"
Two ⅝" through bolts
Spacer block of beam material placed at 5' center
12'-0"

FIG. 46—4,000/230/115-VOLT SINGLE-PHASE TRANSFORMER INSTALLATION. 25 KVA. OR SMALLER

FIG. 47—4,000/230/115-VOLT SINGLE-PHASE TRANSFORMER INSTALLATION. 30 TO 50 KVA. INCLUSIVE

FIG. 49—6900/230/115-VOLT SINGLE-PHASE TRANSFORMER INSTALLATION. 50 KVA. OR SMALLER

FIG. 48—4,000/230-VOLT THREE-PHASE TRANSFORMER INSTALLATION 15 KVA. OR SMALLER PER TRANSFORMER

FIG. 50—6900/460 OR 230-VOLT THREE-PHASE TRANSFORMER INSTALLATION. 15 KVA. TO 100 KVA. PER TRANSFORMER

FIG. 51—6900/2300-VOLT THREE-PHASE TRANSFORMER INSTALLATION. 25 KVA. TO 100 KVA. PER TRANSFORMER

FIGS. 46 TO 51—POLE-TYPE TRANSFORMER INSTALLATION FOR DISTRIBUTION SERVICE

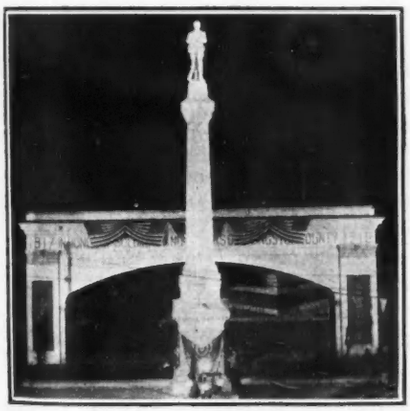
Central Station Business

Advertising, Selling and Service Methods
Commercial Organization and Management, Customer and Trade Relations, Public and Financial Policies, and Reports of Company Plans and Experiences

Increasing Revenue by Floodlighting

WITH increasing use of floodlighting in the larger cities, utility companies serving smaller communities should not forget that in the average small city an effective display of floodlighting makes a greater impression than in the larger community. In addition to the value of floodlighting as a constant advertisement of electric lighting it is also an effective means of increasing the gross income.

A notable example of a small city floodlighting project was installed



THIS WAR MEMORIAL IS FLOODLIGHTED BY TWELVE UNITS TOTALING 5,500 WATTS

last fall at Pontiac, Ill. When the lighting engineers of the Public Service Company of Northern Illinois learned that the County Court House was to be illuminated by festoons for a home-coming anniversary they offered to floodlight the war memorials adjacent to the building. Working with engineers from the Curtis Lighting Company, they laid out a system of twelve floodlighting units with a total wattage of 5,500. The effect of this installation is shown in the accompanying illustration.

Nothing was mentioned at that time about the sale of the equipment and the utility stood the entire expense; but after the system had been in operation the local business men, aided by the County Board, desired to purchase the apparatus and continue its use, provided the city would pay for the energy consumed. This was done, and the installation, costing $500, serves as a silent advertisement of electric service, besides adding a substantial lighting load to the lines of the company.

Customer-Ownership at Cincinnati

How the Union Gas & Electric Is Selling Preferred "Series A" Shares to Customers—Company's Investment Department Offers Assistance in Resale

ON JANUARY 21 this year the investment department of the Union Gas & Electric Company, Cincinnati, Ohio, fired its opening guns in a customer-ownership campaign which had been called to public attention for several weeks in advance by regular and impressive newspaper advertising. The campaign had been carefully organized and planned and was based on a very exhaustive analysis of other utility companies' methods as well as on the Cincinnati company's own experience in conducting a series of very successful house-wiring campaigns during the past three years.

Preferred shares of the capital stock of the Union Gas & Electric Company are being offered to its customers in the Cincinnati district at the par value of $100 per share, with cumulative dividends at $6.60 per year.

In its newspaper advertising as well as in salesmen's talks with prospective buyers the company is impressing upon the public that it is giving the community it serves an opportunity to share in the earnings of the company by becoming part owners through the purchase of preferred shares of the company's stock. Emphasis is also being placed on the fact that dividends will be paid the first of each month. The preferred stock being offered in this campaign amounts to $5,000,000, and if the carefully planned out program which the company is following is as successful as the house-wiring campaigns previously referred to, all of this original issue of stock will be exhausted shortly. In this campaign it is not so much the desire of the company to raise money as to distribute the stock as extensively as possible among the people in the community it serves.

To make the stock attractive, it is classed as "Series A" shares, indicating that no other issue of preferred stock is outstanding and serving also to distinguish it from any issue of preferred stock which might be issued later. None of this stock will be sold by the company at less than the par value. As the company pays income taxes to the United States government, dividends on this stock are not subject to the normal federal income tax no matter where the stockholder lives. The stock is being offered to the customers on a permanent partnership basis, the company reserving the right to redeem it at $102 and accrued dividends. If under any unforeseen and very unlikely circumstances the dividends on this stock were deferred for a period of twelve months, each share would have voting rights equal in every way to those of each share of common stock until all dividends on the preferred stock were paid in full to date.

Deferred-Payment Plan

Easy-payment terms are being offered, or the stock may be bought for cash. On the easy-payment plan the buyer pays $10 down for each share and $10 per month thereafter. The monthly installment of $10 per share will be added to the customer's gas or electric bills; or, if the customer so desires, separate bills will be made out for stock payments.

The stock purchased on the easy-payment basis does not cost any more than if purchased for cash. Furthermore, interest on install-

ments at the rate of 6 per cent will be credited on the books of the company to apply against the final payment. The interest on each payment will begin on the date that such payment is received by the company and will continue until the date on which the stock begins to earn dividends for the purchaser. The final payment will be less than $10, as the interest that the previous payments have earned at 6 per cent will be deducted from that amount in making out the final bill that is sent to the buyer of the stock.

For the benefit of buyers who may wish to resell the stock at any time, the company's investment department offers to assist any stockholder to sell his stock. The company also points out to the public that bankers are willing to accept such stock as security for loans and usually give preferred stock of the character being offered a higher rate of borrowing power than is allowed on stock of companies engaged in many other classes of business.

To conduct the campaign all employees of the company were organized into teams and encouraged to earn commissions. Twenty full-time salesmen who had been used in the house-wiring campaigns previously referred to were employed. They were placed under the supervision of the investment department of the company, and each one was confined to a limited territory where he might concentrate his efforts. The value of this procedure was learned from the house-wiring campaign. The boundaries of each salesman's territory were determined both by the number of prospective customers therein and by their probable buying power.

Each salesman was provided with a list of the "prospects" in his territory, to which were added those coming in from time to time as the result of the advertising campaign. The Cincinnati method of paying salesmen on a sliding scale is considerably different from that followed by many other companies throughout the country. All other practices, however, were carefully investigated and the present method was adopted because it had been found particularly beneficial in the house-wiring work with the same salesmen. The unit commissions paid were based on other companies' practices, combined with previous experience of the company in house wiring.

Electric Cooking School at Boston Arouses Interest

WHAT is believed to be the first co-operative electric range exhibition and cooking school thus far organized by a group of participating manufacturing, central-station and newspaper interests came to a highly successful conclusion at Boston on April 12. Horticultural Hall, a noted building in the Back Bay district, was literally stormed by the interested public, the attendance in six afternoon and evening sessions and one extra morning session approximating ten thousand.

Last fall the Boston *Herald-Traveler*, under the direction of W. D. Nugent, manager of national advertising, organized a "better homes bureau test kitchen" at the headquarters of this newspaper on Tremont Street, in the heart of the Boston shopping district, with the object of providing a neutral laboratory or popular experiment station where the benefits of electric cooking and other domestic applications of electricity could be demonstrated to the public and new ideas in household management and electric service impartially tried out. Thousands of visitors from all over eastern New England have inspected this kitchen, and numerous others have received information by mail or wire from this headquarters.

Electric cooking schools run by a single electric range manufacturer in conjunction with a local central-station company have been conducted for years in this country to stimulate popular interest in ranges and allied equipment. In the Boston case, however, the fundamental idea stressed has been electric service in the kitchen, special emphasis being laid, of course, on cooking. Four competing manufacturers joined hands with the Edison Electric Illuminating Company of Boston and with the *Herald-Traveler* to establish and maintain for the week agreed upon a thoroughly representative display of

BOSTON "HERALD-TRAVELER" ELECTRIC COOKING SCHOOL WHILE LECTURE WAS IN PROGRESS

the latest methods of modernizing kitchen practice.

C. E. Greenwood, manager of the Edison company's merchandising department, organized the manufacturers' co-operation and represented the central-station interest in the work. Mr. Greenwood's initial conception of the value of group co-

"The Friendly Glow"

The EDISON Shop 39 Boylston St.

The most important announcement ever made on the household use of EDISON LIGHT:

ELECTRIC cooking is now a fact. The obstacles of ignorance have been swept aside and the technical problems of furnishing cooking-electricity cheaply and surely have been solved.

Greater Boston can now cook by electricity

And as a result of the sensational progress in range manufacturing methods during the past year, the housewives of Greater Boston can now buy an electric range, *installed in the kitchen ready to cook*, at a lower figure than any price at which such ranges have ever been offered in Boston!

The range-makers have joined with The Herald-Traveler Better Homes Bureau in opening this demonstration of electric cooking to the women of Greater Boston in Horticultural Hall. We want you to examine the ranges displayed at this demonstration, and put them to the severest tests your household experience suggests.

Then drop in at The Edison Shop, at 39 Boylston Street, or at any District Office of Edison Light, and let us arrange for the immediate installation of the range you prefer, in your kitchen, on easy time payments.

BID drudgery good-by, the time you've spent at the cook-stove will all come back in time saved for the finer, better things of life, once you have put this fireless, dirtless, expert and inexpensive electric cook to work for you. The cost of the electricity itself is one of the lowest rates for cooking in the country

SINCE 1630 Boston has cooked with visible flame; 1924 marks the beginning of a new era in domestic emancipation among the women of our community.

EDISON LIGHT
of BOSTON

BOSTON EDISON ADVERTISING TIED IN WITH ELECTRIC COOKING SCHOOL

operation on the part of the manufacturers and his success in "selling" the idea of group participation have been a primary factor in the success of the enterprise. The co-operating manufacturers, all of whom have entered into the program with enthusiasm and a broad-minded desire to work in unison for the advancement of electric cooking, were the Edison Electric Appliance Company, Inc., Chicago; Landers, Frary & Clark, New Britain, Conn.; Westinghouse Electric & Manufacturing Company, Pittsburgh, and the Walker & Pratt Manufacturing Company, Boston.

Admission to the exhibition and school was by coupon published daily in the *Herald-Traveler*. The program included lectures and demonstrations daily at 2 p.m., two halls being required to seat the large numbers of women in attendance. A special photogravure supplement of the Boston *Herald-Traveler* was published on Sunday, April 6, carrying photographs of the modern kitchen and of the staff of lecturers engaged for the week, advertisements of the Edison company and the manufacturers of electric ranges and other devices of household interest. Tested recipes were published daily, and full accounts of the lectures published. On the opening afternoon and evening, a stormy day, more than one thousand persons attended. Toward the end of the week hundreds were unable to gain admittance to the hall.

A follow-up advertising campaign, to run until about June 1, will consist of daily insertions in the press featuring the products of individual manufacturers according to lot and in regular order, with comprehensive publicity, on the general subject of electric cooking by central-station service.

Nipping Customers' Complaints in the Bud

ONE man is employed for part of his time by the Memphis Power & Light Company to visit its larger industrial and commercial customers every month and obtain their comments regarding the service. About one hundred such customers are visited, and what they say is recorded and turned over to the superintendent of the distribution department. Most comments are favorable and are utilized by the commercial department along with other information in obtaining new business. When complaints of service are submitted the cause of which can be quickly corrected or explained, the man making the survey does one or the other. Immediately upon receipt of any complaint the superintendent writes the customer a personal letter saying that the complaint has been brought to his attention and that as soon as an investigation shall have been made he will make a report of what can be done to remedy the trouble. In some cases the cause of the complaint can be explained without an investigation and the customer satisfied. In cases requiring investigation a troubleman is dispatched promptly and required either to remove the cause, if this is simple, or report it back for correction. Extreme care is taken to follow up these reports promptly.

As a result of this practice the utility first of all makes its customers feel that it is interested in more than collecting bills. Besides, by making these surveys monthly, it is able to nip dissatisfaction in the bud before it grows to great magnitude in the minds of the customers. The consequence is that very friendly relations are maintained. The benefits from work on this limited scale have been so apparent that the company now has under consideration the establishment of a "trouble department" through which all complaints will be received by telephone or otherwise and quickly followed up for adjustment.

Selling 145 Washing Machines in Twelve Days

By W. T. Ryan
Industrial Engineer Washington Water Power Company, Spokane, Wash.

AS AN example of what can be done in a twelve-day aggressive sales campaign the Washington Water Power Company sold 145 washing machines in Spokane and the fifty-four towns served by the company. Seventy-eight of these were sold in the city of Spokane and the remainder in twenty-three small towns.

In Spokane $770 was spent in newspaper advertising, the first advertisement appearing just before March 3, the date the campaign started. For the smaller towns $300 was spent in newspaper advertising. Three models of a popular make of washer were offered. As special inducements the payment down was fixed at $1 and a premium of one 25-lb. pail of soap bearing the same name as the washer was offered. The retail value of the soap was $5.75, and it is sufficient for a hundred ordinary washings, or for nearly two years.

Of the washers sold in Spokane, nine were credited to the company's electric store and sixty-nine were sold by seven regular city salesmen. The sales in the smaller towns were made by the regular district agents. Not one outside person was employed in the campaign. In the city sales quotas were assigned to salesmen based on points, a system which has been used successfully in other campaigns. Each salesman making his quota was to receive a bonus of $20, and in addition there were offered weekly two prizes of $15 to be distributed in the ratio of three, two and one to the three salesmen selling the highest percentage of their individual quotas. Of the seven salesmen, three oversold their quotas and won the special bonus. The points credited to the salesmen for the three types of machine offered were so arranged that there was a strong inducement to sell the better machines. The gross sales in the campaign as billed to the purchasers amounted to $22,424.

Digest of Electrical Literature

Including Brief Abstracts of and References to
Important Articles Appearing in the Scientific and Engineering Press
from All Parts of the World

Photostat copies or English translations of complete articles will be furnished at cost upon request

Generation, Control, Switching and Protection

Eddy Current Losses in Armature Conductors. — R. E. GILMAN. — This paper is an extension of the author's paper in Vol. XXXIX, pages 997 to 1047, on this subject. In this present paper additional formulas are given for the cases where transposed coils are used, as well as methods for quickly estimating the increased loss due to eddy currents.—*Journal of A. I. E. E.*, March, 1924.

Switching High-Voltage Cables.—J. FALLOU. — To investigate the nature and magnitude of the overvoltage created in connecting and disconnecting a cable to the supply circuit, a series of tests were made in Paris on the cables of the Gennevilliers power system which are described in this article. The circuit tested was a three-phase underground line, consisting of three single-conductor cables operating on 50,000 volts and 10 miles long. This cable was connected and disconnected to and from a bus carrying through similar cables power of from 47,000 kw. to 77,000 kw. at 50 kv. By means of a three-vibrator oscillograph the bus voltage, the voltage across the oil switch and the loading current through the cable were measured simultaneously. No overvoltages were recorded upon closing the switch. The opening, however, gave rise to transient phenomena, comprising repeated reignition of the arc after the breaker contacts separated, charging and discharging currents of a frequency of from 2,660 cycles to 4,660 cycles and voltages of up to twice normal potential. While the switch employed for these tests was an ordinary explosion-chamber type of high rupturing capacity, the author believes that, under certain circumstances, dangerous overvoltages could be eliminated or at least greatly reduced with a step resistance switch.—*Revue Générale de l'Electricité*, March 15, 1924.

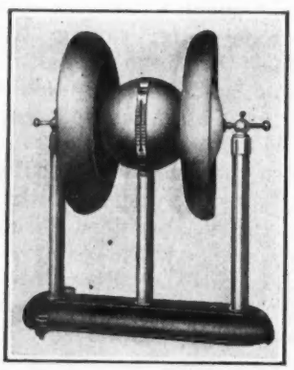
Transmission, Substations and Distribution

Ground Protection of High-Voltage Networks.—J. JONAS.—In this mathematical paper the author discusses and compares the features of three methods of protection of high-voltage networks against ground troubles, viz., direct grounding of the Y-point; inductive grounding of the Y-point and phase grounding over an artificial neutral. He arrives at the following conclusions: Direct grounding is of advantage only for lines of more than 80 kv. Inductive grounding may be recommended regardless of voltage. The phase grounding is best suitable for systems where a number of lines, each of which is to be protected, radiate from a station. No permanent losses and voltage displacements can occur with direct grounding. For inductive grounding with a dissonance coil these losses are small. Constant iron losses will result with the customary inductive phase grounding. Constant copper losses are inherent with the new phase grounding. The author claims that the cost of direct Y-grounding will be approximately the same as the cost of a dissonance coil. The heavy insulation needed on grounding coils of the old and new phase-grounding method will cause higher cost than the two former methods. — *Bulletin de l'Association Suisse des Electriciens*, January and February, 1924.

Graphical Calculation of Overhead Electric Power Transmission Lines.—W. T. TAYLOR.—A chart for solving transmission problems, particularly adapted to systems in Great Britain, has been constructed by the author. He discusses the various factors entering into the solution of a transmission problem and gives a statement as to the accuracy of the method.—*Selected Engineering Paper No. 13 of the Institution of Civil Engineers (England).*

Units, Measurements and Instruments

Electrostatic Voltmeter. — K. A. STERZEL.—For the direct measurement of alternating-current voltages between 40 kv. and 250 kv. the author has devised a simple and directly indicating



DIRECT INDICATING ELECTROSTATIC VOLTMETER FOR POTENTIALS UP TO 250 KV.

voltmeter which is to a high degree independent of the frequency, of its particular location in a room and of the position of the connecting lines. Within a brass sphere of about 12 in. diameter, which is supported on an insulated column, is mounted an electrostatic voltmeter of the usual bi-quadrant type, with its pointer swinging along a scale drawn on an equator or a meridian of the sphere surface. This voltmeter is designed for about 2,000-volt end deflection. At right and left of this sphere are mounted on insulating columns bowl-shaped metal armatures approximately concentric with the middle sphere. These two armatures are connected directly to the circuit to be measured. Between the two armatures and the central sphere a very uniform electrostatic field is formed, so that the indications of the voltmeter are almost perfectly proportional to the impressed voltage. For various voltage limits the distance between armature and sphere and the size of the two are changed.—*Elektrotechnische Zeitschrift*, Feb. 14, 1924.

Magnetic Testing of Small Specimens.—T. F. WALL.—Methods for testing small samples have been in use which involve the use of a large electromagnet with special search coils. If the test has to be carried out for values of H which are considerably larger than about 2,000 gausses, it is usually necessary to use special H search coils. For the testing of magnetic qualities of a specimen up to about 2,000 gausses, however, it is considered that the method described has considerable advantage both as regards the simplicity of the experimental work and also as regards the accuracy with which the measurement can be made over the whole range of H down to very small values. A leading advantage of the method is that a closed magnetic circuit is used, and consequently no H search coils are necessary. A number of actual practical tests have been carried out by means of this method and the results obtained are detailed.—*Engineering*, March 7, 1924.

Comparison of Capacities and High Resistances. — J. TAYLOR and W. CLARKSON.—The paper deals with the application of the "flashing" of the neon discharge tube to the measurement of capacities and high resistances. It is found that the relations both between the period of flashing and the resistance in the circuit, for a given capacity across the lamp electrodes, and the period of "flashing" and the capacity across the lamp, for a constant resistance, are linear to a high degree of accuracy. These linear relations are applied to the measurements of resistances and capacities. An extension of the method utilizes beats between two neon-lamp circuits "flashing" at high frequencies for the measurement of small capacities.—*Journal of Scientific Instruments (England)*, March, 1924.

Illumination

Principles Governing the Proper Utilization of Daylight in Roof Fenestration.—W. S. BROWN.—Sources of daylight with which the architect has to work are briefly described as regards their intensity, direction and seasonal and diurnal variation. The usual requirements for natural illumination are outlined, and some of the general principles governing the utilization of the latter in roof fenestration are set forth —the entering daylight being analyzed as consisting of (a) sunlight directly admitted to the working space, (b) light from the sky only, directly admitted to the working space, and (c) combined light from sun and sky—or from

portions of the sky alone—diffusely reflected from adjacent interior or exterior surfaces. Methods of evaluating each are described and examples worked out for the usual types of roof fenestration.—*Journal of I. E. S.*, March, 1924.

Use of Synchronously Intermittent Light in Industry.—J. F. CROWLEY.—A production of stroboscopic effects when moving objects are viewed by the light of an alternating-current arc is familiar. But the light, while undergoing marked fluctuations, is not completely extinguished at the moment of reversal of current, whereas when a neon lamp is used the changes of current are followed instantaneously by the light. Hence, with this source the effect is more marked and is very suitable for experiments on moving objects. The author describes a stroboscopic apparatus and indicates its importance. The significant part of the recent development has been the evolution of robust portable workshop types of instrument to replace the laboratory apparatus, which requires very careful work in setting up. The author draws attention to varied applications and shows the principles on which they are based.—*Illuminating Engineer (England)*, Vol. XVI., Nos. 8 and 9.

Motors and Control

Electricity and Textiles.—This issue of the *Electrician* is devoted entirely to the subject of electricity in the textile industry. Driving textile mills, driving flax-spinning mills, the manufacture of carpets, fabric printing and textile electrification in Europe, all with particular reference to electric motor drive and control, are among the subjects discussed in the six articles included.—*Electrician (England)*, Feb. 29, 1924.

Electric Blasting in Mines.—W. VOGEL.—Electric ignition of blasts in mines is being accomplished today almost exclusively by glow-wire detonators, any number of which may be connected in series for simultaneous shots. Parallel connection of detonators is less reliable and may cause unexploded shots. Rubber-insulated cables, laid out on the ground, may connect the individual blasts, or bare iron wires nailed to dry timbers may be used. The latter method is preferred. The required current may be derived from either a special blasting dynamo or from the lighting circuit. In the latter case carefully designed and "foolproof" switches are in general use. These switches can be closed only with the foreman's key. In mines with electric traction and rail return, blasting accidents caused by erratic return currents are liable to occur. About 2 volts is required to set a detonator off, and unless the rails are kept in perfect order and are well bonded, accidental ignition of one or more shots may happen under certain circumstances. Several such mishaps from actual practice are described and explained. It is recommended to lay old hoist cables along the tracks and to provide frequent metallic connections between both rails and this steel cable.—*Elektrische Betrieb*, March 10, 1924.

Heat Applications and Material Handling

Instantaneous Electric Water Heaters.—F. BERGER.—The author describes and recommends for household use small instantaneous water heaters requiring only 1 kw. of energy. With an incoming water temperature of 12 deg. C. these apparatus furnish 0.5 liter of 40-deg. water per minute. The water faucet can be regulated for a less amount of hotter or a larger volume of cooler water. Three main types have been developed: (1) An immersion unit heater, with heating cartridge placed within a small water tank, suitable for direct or alternating current at lamp voltages; (2) a transformer type, wherein the water flows through a brass pipe, which forms the short-circuited secondary winding of a 1-kw. transformer suitable for alternating current of any voltage, and (3) an electrode type, with the water itself as resistance.—*Siemens Zeitschrift*, February, 1924.

Contact Potential.—S. TAKEGAMI.—When a galvanic cell is constructed out of two half cells the measurable value of the electromotive force is the algebraic sum of the potential differences of these two single electrodes and the contact potential which develops at the junction of the two unlike solutions. Thus, whenever the necessity occurs to determine the electromotive force of one of these single electrodes it is a matter of first importance to know the value of the contact potential. In general, however, it is impossible to determine this experimentally as it cannot be measured separately. With the measurement of the contact potential impossible, the electromotive force of the single electrode cannot be determined. Many investigators have deduced theoretical expressions for the calculation of the value of a contact potential, but these formulas are not satisfactory on account of the many variables entering into them. If some method of the conjunction of cells were devised by which no contact potential should develop, many difficulties would be overcome. Experiments along this line are discussed by the author.—*Memoirs of the College of Science, Kyoto Imperial University*, Vol. VII, No. 2.

Traction

Electric Operation of Paulista Railway in Brazil.—GUY BELLOWS.—Data are given on service requirements, locomotive performance and cost of service for the 28 miles of electrified road of the Paulista Railway in Brazil. As may be seen from the accompanying table, the cost of electric operation is approximately one-third of steam, which is principally due to the fact that all coal used on the locomotives must be imported. It is interesting to note that over a month's period 667,105 kw.-hr. was used for motoring, and of this amount 88,035 kw.-hr. was regenerated by the locomotive, this being 13.2 per cent of the total used.—*Railway Age*, March 22, 1924.

COMPARISON OF STEAM AND ELECTRIC COSTS ON PAULISTA RAILWAY

	Cost per Train-Mile, Cents	
	Steam	Electric
Operating trains	63.09	19.30
Locomotive repairs	6.83	2.18
Transmission-line operation and maintenance	.....	0.46
Trolley-line operation and maintenance	.....	1.03
Total	69.92	22.97

Semi-Automatic Railway Substation.—The Concord (N. H.) Electric Railways has installed a semi-automatic substation which has been worked out to obtain all possible automatic features that could be obtained at minimum cost, without going to the expense of installing full automatic equipment. The 500-kw. unit needs only to be started in the morning, operates without attention and shuts itself down automatically at night. The installation is a decided improvement over an earlier station that was destroyed by fire.—*Electric Railway Journal*, March 1, 1924.

Telegraphy, Telephony, Radio and Signals

Function and Design of Horns for Loud Speakers.—C. R. HANNA and J. SLEPIAN.—A discussion of the function of the horn, together with theoretical considerations concerning the design of the horn to perform this function in the best way. In the body of the paper proof is given to show that the exponential increase in section gives the best results. A large part of the appendix is given to the analytical solution of the propagation of sound in exponential horns. From the results of this work and the well-known equations relating to first-order effects in the telephone receiver, formulas are developed which make possible the design of horns.—*Journal of A. I. E. E.*, March, 1924.

Electric Wave Filters.—D. E. RICHMOND.—The electric wave filter is a device which when placed in an electrical system between a receiving instrument and a source of alternating voltages of different frequencies attenuates the undesirable frequencies to a point where they do not affect the instrument. They have been particularly useful in telephone receiving instruments. The four principal types are the low-pass, high-pass, band-pass and band-suppression filters. The author gives a summary of the uses of these filters and discusses mathematically the type to use.—*Sibley Journal of Engineering*, March, 1924.

Secondary Standards of Wave Length.—W. F. MEGGERS, C. C. KIESS and K. BURNS.—An international system of secondary standards of wave length, derived from the iron-arc spectrum, was established by the International Union for Co-operation in Solar Research during the years from 1905 to 1913. In July, 1919, the International Astronomical Union was organized to replace the body which existed before the war. Radical changes have been made in the standard iron arc, so that it became necessary to redetermine the secondary standards of wave length. The authors give the new results.—*Scientific Paper No. 478 of the Bureau of Standards.*

New Books

Reviews of the Latest Contributions to
Technical, Industrial and Commercial Literature of Particular Interest
to Members of the Electrical Industry

Diathermy and Its Application to Pneumonia

By Harry Eaton Stewart, M. D. New York: Paul B. Hoeber, Inc.

Medical electricity—the mother of the electric arts and sciences, electricity having first been studied largely by physicians—has depended until recently on two modes of influencing vital conditions, the effect of electrolysis and ionization by the direct current and the effect of wave stimulation of nerve and muscle by slowly interrupted and alternating currents. The development of high-frequency currents, also by physicians, in recent decades has added another remedial method to both medicine and surgery, that of through-and-through heat effects, with their resultant immediate stimulation of vital actions. It is to the effects of such applications in pneumonia that this book is devoted.

Specialists in electrotherapy have studied these through-and-through heat applications to chronic inflammatory affections with increasing interest, but not until Dr. Stewart made use of his facilities in the United States Marine Hospital No. 21 in New York was diathermy tested in that serious and baffling acute affection of the lungs, pneumonia.

Dr. Stewart has presented the results of diathermy applications in nearly a hundred cases of pneumonia in this work, accompanied by detailed case histories and charts. His interpretation of the results is modest, but it is evident that mortality has been lessened by the applications and that great comfort has been given to patients. Indeed, it would appear that no patient should be lost if the treatment be begun early in an uncomplicated case.

The directions given in the book enable any physician who has a suitable portable generator to employ the method if there be an alternating-current house-lighting outlet in the patient's bedroom. G. B. M., M.D.

Handbook for Sales Management

By S. Roland Hall. First edition. New York: McGraw-Hill Book Company, Inc. 995 pages, illustrated.

For the sales or commercial manager this book contains a wealth of valuable information on tested sales policies. It is in reality a comprehensive and well-arranged review of modern sales practice and management illustrated by the methods and experiences of many representative selling organizations. The author has succeeded in presenting the subject in a most understandable and interesting manner, analyzing the strong and weak points of various plans of organization and sales programs. Various methods of recruiting and training salesmen are discussed, together with suggestions for scheduling and carrying out special campaigns. Budgeting of sales expense and the proper correlation of advertising with sales effort are of particular value in showing the percentage spent for advertising of various products and how the salesmen can make the most effective use of general and specific publicity. The book is made particularly accessible for reference uses by a complete cross-index.

Control of Speed and Power Factor of Induction Motors

By Miles Walker, M.A., D.Sc. London: Ernest Benn, Limited. 145 pages.

Professor Walker's book on the speed and power-factor control of induction motors comprises eight chapters, with numerous pictures and diagrams. The first chapter is devoted to the wide application of the circle diagram, while in the second chapter the geometry of the circle diagram is discussed to a limited extent. The third chapter deals with the different methods of changing the speed of induction motors, and the fourth chapter deals with ship propulsion. The fifth chapter is a continuation of the third chapter, while in the sixth chapter the Hunt cascade motor and Creedy's modification are discussed. In the seventh chapter the control of speed and power factor through commutating devices is discussed. The eighth and concluding chapter deals with the phase advancer. This comprehensive program is covered in the short space of 145 pages, in very large, legible type, interspersed with halftones and geometric figures. It is an attractive book.

Professor Walker bases his entire discussion of the different subjects referred to on the theory of the circle diagram, which he treats solely through the method of inversion. While this method has its own usefulness, if taught by itself it tends to obscure the real physical phenomena back of the theory. It also seems to lack some of the simplicity which the plain physical relations offer, and which makes it possible to read off, so to speak, the circle characteristics from laying out the fluxes, as done in the Blondel-Kapp-Behrend diagram.

It is, however, when we turn to the more complex relations that we are disappointed in Professor Walker's book. It is a pity that he has not treated thoroughly the theory of induction motors in cascade and that he has also completely omitted any treatment of the commutator motors, which really belongs in a book with the scope of his title. It is disappointing that some of these difficult problems, a discussion of which would have been interesting to the engineer, have been avoided. Other authors, not of the academic profession, like Steinmetz and Behrend, have not shirked these difficult problems in their treatises, but have gone through with them to the best of their ability.

It is also to be regretted that no discussion of the single-phase motor, so closely allied to the cascading problem, is given in this book. In the chapter on ship propulsion Professor Walker gives the polar diagram first published by Behrend in "The Induction Motor," but he does not appear to take advantage of the interpretation of this diagram, which shows that the method of using two rotor windings results in creating a motor which is virtually emasculated and shorn of its potential capacity. The greatest disappointment is felt in the chapter on cascade connections, in which no complete theory is worked out and in which is not even found a diagram giving the locus of the primary current for the speed range. However interesting and easy reading the book appears to be, one cannot help but feel that it is too technical for the man who merely owns one of the machines described therein and not technical enough for the designer, who has to build them. The keenest disappointment is felt in the absence of solutions of the complex and difficult phases of the induction-motor theory, as suggested by the problems which are discussed, but not solved, like induction motors in cascade, speed regulation, motors of the Schrage type, and other problems connected with the use of commutators and induction motors.

Practical Electrotherapeutics and Diathermy

By G. Betton Massey, M.D., fellow and former president American Electrotherapeutic Association, etc. New York: Macmillan Company. 401 pages, illustrated.

In no field of modern medicine are the advances more rapid than in the application of the physical forces of nature to the treatment of disease and injury, termed physiotherapy. Electrotherapy is the cornerstone of this branch of therapeutics. Those whose work is concerned with the investigation and application of electrical energy in commercial life will be interested in learning of the newer application of this form of power in medical practice.

The author's aim is to avoid the complicated mathematical expositions of electrophysics understandable only to the electrical engineer and the lengthy description of obsolete apparatus which has lessened the practical usefulness to the average medical reader of many texts on this subject. He has covered in a fairly comprehensive manner the application of electric power in the treatment of diseases falling in the various specialties of medicine.

There is a real need of correlated effort between the electrical engineer and the medical clinician skilled in the application of this form of energy in therapeutics in the development of new and better electro-medical apparatus. Great as are the advances being made along this line by the larger instrument-manufacturing houses, much work remains to be done. The book is recommended to the reader interested in all the uses of electrical energy as being a good description of its modern application in the field of medicine. H. E. S., M. D.

News of the Industry

Chronicle of Important Events and General Activities, Announcements and Reports of Association Meetings, Court Decisions and Commission Rulings and News of Electrical Men

Davis for Boulder Dam

Declares It the Proper Central Point for Development of the Colorado and Opposes Mohave Plan

TESTIFYING before the House committee on irrigation, A. P. Davis, former Director of the Reclamation Service, declared the other day that the Boulder Canyon site is the hub around which all the hydro-electric and irrigation development of the Colorado River should be built. Mr. Davis insisted that work at Boulder Canyon could be done at greater speed and less cost than at any other feasible site on the river and that all other developments would fit in with the initial work at this site. He vigorously opposed the proposals that development of the Colorado River start with a flood-control reservoir at Mohave, asserting that this proposition should be dismissed because it presented what he described as "endless opportunities" for delay and, he asserted, would be "inexcusable from every point."

The topography at Mohave, said Mr. Davis, is such that a dam there would be unfeasible for power development; the stored water would be susceptible to evaporation, and the entire project would be more expensive than similar work at Boulder Canyon. Mr. Davis declared that the Mohave site is low, hot, shallow and exposed to wind, and therefore is unsuited for water storage. The Boulder Canyon site, he asserted, affords opportunities for a deep, narrow reservoir that would not present difficulties of this character.

George H. Maxwell, executive director of the National Reclamation Association, on the other hand, criticised the Boulder Canyon proposal in his testimony before the committee. Steps to protect Imperial Valley in California against floodwaters should be the outstanding consideration in the development of the Colorado River, Mr. Maxwell urged. He declared that the committee should eliminate every other factor until flood-control means have been devised. In his opinion the chief influence behind the proposal to construct a dam at Boulder Canyon is the desire to secure water for irrigation in Mexico.

At another hearing T. A. Panter, electrical engineer of the Bureau of Power and Light of the city of Los Angeles, who would have charge of the distribution of the power which would be taken by the city from the project, told the committee that Los Angeles would "guarantee to take whatever power is left after other communities are served," and said that the rate at which the city is growing makes it evident that the consumption of hydro-electric energy will increase from the present 100,000 hp. to 600,000 hp. by 1930. He explained that the first generating plant can be built as soon as the dam reaches half the contemplated height of 605 ft.

In answer to complaints that he had gone outside the specific provisions of the Swing-Johnson bill in his official criticisms of the Boulder Dam project O. C. Merrill, executive secretary of the Federal Power Commission, said that he had merely intended to point out in round figures what the project was likely to cost before it was through, and that this money would be a charge against the United States whether it was paid out of the original authorization or elsewhere provided for.

New York Edison Company to Be Investigated

The supplemental appropriation bill passed by the New York State Legislature contains an item of $50,000 to cover expenses to be incurred by the Public Service Commission in its coming investigation and hearing in the matter of the New York Edison Company in relation to complaints as to rates, charges and classification of service. This money will be expended for the most part in collecting and collating engineering data on costs and related matters. No date for the hearing has been set.

N. E. L. A. Program Nearly Ready

Secretary Hoover, Governor Pinchot, Senator Capper and Other Widely Known Men to Address Atlantic City Convention —Outline of Proceedings

ARRANGEMENTS for the great annual convention of the National Electric Light Association, which this year is to be held at Atlantic City, N. J., from May 19 to May 23 inclusive, are in their final stage, and next week the program in detail will be printed in the ELECTRICAL WORLD. Everything points to a largely attended, notable and enthusiastic gathering. Among those who will address the convention along general and public relations lines will be Herbert Hoover, Secretary of Commerce; Senator Arthur Capper of Kansas, Governor Gifford Pinchot of Pennsylvania, H. G. Taylor, president National Association of Railway and Utilities Commissioners; Herbert Bayard Swope, executive editor New York *World;* Prof. Dugald C. Jackson, Massachusetts Institute of Technology, and Dr. E. A. White, director of the Joint Committee on the Relation of Electricity to Agriculture.

OUTLINE OF PROGRAM

The afternoon programs of the convention have already been outlined for the four national sections—Public Relations, Technical, Commercial and Accounting—and, as will be seen below, a prominent part will be taken by many nationally known executives of light and power companies, electrical engineers and others.

On Monday the first-named section will listen to an account of state public utility bureau activities and probably to the address by H. B. Swope.

On Tuesday all four sections will discuss committee reports. The Public Relations Section will be especially interested in Vice-president Davidson's account of the plans of the new illuminating educational committee.

On Wednesday Dean Wallace B. Donham, Graduate School of Business Administration, Harvard University; Prof. C. O. Ruggles, Ohio State University, and two university presidents will talk before the Public Relations Section on the relations of the industry to educational institutions. R. F. Pack of Minneapolis, John R. Freeman of Providence, V. Z. Caracristi of New York and John C. Parker of Brooklyn will address the Technical Section. The Commercial Section will listen to Preston S. Millar of the Electrical Testing Laboratories, Charles J. Russell of Philadelphia, J. G. Barry of the General Electric Company, H. D. Shute of the Westinghouse Electric & Manufacturing Company, F. A. Ketcham of the Western Electric Company, T. O. Kennedy of Cleveland and general speakers from outside the industry. Herbert A. Wagner of Baltimore, H. P. Liversidge of Philadelphia, John F. Gilchrist of Chicago, H. M. Edwards of New York and Carl D. Jackson will address the Accounting Section.

On Thursday the chief speakers before the Public Relations Section will be John B. Miller of Los Angeles and W. D. B. Ainey, chairman Pennsylvania Public Service Commission. Alex Dow and John W. Lieb are to speak at the Technical Section meeting, as well as David F. Simpson, former associate justice of the Minnesota Supreme Court. The Commercial Section will hear H. E. Sandoval of San Francisco, T. I. Jones of Brooklyn, G. E. Miller of Cleveland and John W. Carpenter of Dallas. Four well-known accountants or statisticians—Louis Musil, Stuart C. McLeod, John T. Madden and George C. Mathews—are to address the Accounting Section.

Champion Hooker Bid for Muscle Shoals

Witnesses Before Senate Committee Assert It to Be Far Better than Ford's or Southern Power Companies'—Hooker, Atterbury and White Testify

RETURNS to the government from the operation of Muscle Shoals under the Hooker-White-Atterbury bid would be more than double those of the Alabama Power Company and its associates and more than treble those under the Ford bid, according to the testimony of F. R. Weller, a consulting engineer of Washington, before the Senate committee on agriculture. Mr. Weller's figures were based upon a period of fifty-six years, six years for the completion of Dam No. 3 to bring the hydro-electric development to its maximum and a lease of fifty years thereafter in accordance with the federal water-power act. On this basis he estimated that returns to the government from the Ford offer would be $90,980,000; under the power companies' offer, $136,400,000, and under the Hooker-White-Atterbury offer, $305,165,000. In this estimate, Mr. Weller figures that the government income from the sale of fertilizer in that period would be $85,526,000, the remainder being profit to the government from the sale of power. The cost of installing Dam No. 3 was calculated by Mr. Weller as $25,000,000. In addition, the Hooker plan contemplates the expenditure of $10,300,000 for research during the life of the proposed lease.

ASSAIL'S FORD OFFER

Mr. Weller asserted that in his opinion the operation of Muscle Shoals by Henry Ford under the Ford offer as it passed the House would be the greatest blow that the industrial future of the South could receive. Basing his conclusions on the statements of Mr. Ford's engineers, Mr. Weller said that it was evident that the Detroit manufacturer intended to build a great industrial city at Muscle Shoals to consume all of the hydro-electric power developed there in his own industries. The South has been developing industrially very rapidly, particularly those sections of Alabama and the Carolinas which have secured cheap power, Mr. Weller said, and future development is dependent upon the further availability of hydro-electric energy. So far as the South generally is concerned, Mr. Weller asserted that it will be better to have the power from Muscle Shoals distributed over a wide area than concentrated for consumption at one point.

Mr. Hugh MacRae of Wilmington, N. C., widely known throughout the South for his work in land reclamation and modern rural community development by means of diversified and intensive farming methods, also told the committee that the Hooker bid is much better than the Alabama Power Company's or Mr. Ford's or any other proposition so far submitted for Muscle Shoals.

Mr. Weller's statement brought forth an argument in the committee as to Mr. Ford's intention, which was closed by Senator Norris stating that the Ford bill contains no guarantees to the contrary of Mr. Weller's statement. "If Mr. Ford will make that guarantee, let him come before this committee and say so," said Senator Norris. "If I should introduce an amendment to the Ford bill requiring him to make such a guarantee, I know what every Ford adherent would do. They would vote against it." This statement had reference to an amendment providing for the distribution of power.

PROMOTERS TESTIFY

It is not the purpose of the Hooker-White-Atterbury bidders to consume all or even a major portion of the hydro-electric development at Muscle Shoals in the chemical and metallurgical plants they have projected there, Albert H. Hooker, chief chemist and technical director of the Hooker Electrochemical Company, Niagara Falls, told the committee. He stated that at first the chemical plant proposed would consume about 110,000 hp., but that as the market for electricity developed this would be reduced to 10,000 hp. or 12,000 hp., coke and water gas being substituted for electrical energy in the chemical works. This witness, as well as Elon H. Hooker, described to the committee in general terms their expectations of developing a fertilizer of highly concentrated strength which could be produced at low cost. It also is expected, according to these witnesses, to produce chlorine to be used in the manufacture of calcium arsenate and paradichlor, a gas for the extermination of the peach borer, and to experiment with other chemicals for use in agriculture and horticulture.

W. W. Atterbury, vice-president of the Pennsylvania Railroad and one of the bidders, told the committee that he became interested in the project because of the possibility of producing at low cost for use in railroad cars and locomotives what he described as a new metal, an alloy of aluminum and magnesium.

J. G. White, the third associate in this offer, estimated to the committee that energy at Muscle Shoals should be sold at about $20 to $40 per horsepower-year on a 40 per cent load factor. He offered to guarantee for the group that if control in the proposed corporation which would take over the project is ever relinquished, the successors to the group would have to carry out the provisions of the agreement between Congress and the Hooker-White-Atterbury combination.

During the examination of Mr. Weller word was received from Henry Ford informing the committee that it would be impossible for him to appear to explain his bid, but that W. B. Mayo, his chief engineer, would testify.

Appearing as a representative of the Tennessee Manufacturers' Association, B. H. Wilkins of Tullahoma, Tenn., urged the committee not to award Muscle Shoals to any private enterprise unless the contract recognized the control of the federal water-power act, assured the completion of Dam No. 3, the distribution of power to adjoining states and the manufacturer of fertilizer in time of peace and munitions in time of war.

Lighting Essay Contest

Large Fund Available for Promoting Competition Among Children—Architects' Contests Also

THE first definite explanation of the plans and purposes of the national campaign for the development of better home lighting that is being organized by the lighting educational committee was presented at the first formal meeting of the committee, held in New York on Wednesday of this week. It was announced that two-thirds of the fund of $500,000 that is being raised among a large number of electrical manufacturers is already pledged. The principal subscribers are naturally from the lighting equipment industry. The fund will be used to finance a national essay contest among the school children.

This will consist of a great number of local contests conducted according to the national plan but under the control of local committees, in which all the children of the public and parochial schools of the grammar and higher grades will be eligible to compete. The children will be provided with a contest book and a series of lessons, and after study and the actual visiting of homes to inspect the lighting equipment, the contestants will prepare short essays and designate in the contest book the lamps and fixtures they recommend for the lighting of a model home which will be pictured in the book. Winners of the local contests will then become eligible for the national competition.

Before the essay contest is held a competition will be conducted among American architects, and prizes will be given for the best three model houses of different sizes in which, of course, the design and specifications for electric lighting and equipment will be a prominent feature. The prize house will be built on any lot provided and presented to the winner of the essay contest. There will be other prizes, principally scholarships and educational tours.

The essay contest will be supported by an elaborate program of local and national advertising and will have the active co-operation of the American Institute of Architects, the National Educational Association and the Eye Conservation Council. The Society for Electrical Development will be employed extensively in the promotion of the campaign. Full details of the plan will be announced at the National Electric Light Association at Atlantic City.

The meeting was devoted largely to the discussion of details of the plan and methods of local organization in cities of various size. The members of the committee are James E. Davidson (chairman), P. B. Zimmerman (vice-chairman), John F. Gilchrist, W. W. Freeman, James R. Strong, Herman Plaut, George Morrison, Walter Cary, C. H. Ferris, Frank W. Smith, N. T. Wilcox, W. E. Robertson, George E. Miller, T. F. Kennedy, A. P. McMicken and Earl E. Whitehorne. The first nine constitute the executive committee.

Wisconsin Operators Thrash Out Problems

State Ownership of Water Power, Interconnections, Merchandising Policies and Utilities' Obligations to Customers Are Paramount at Convention

BEFORE an enthusiastic gathering of four hundred utility operators, many important subjects, including state ownership of water power, the right to occupy the highways, recent developments in administering the electric safety code and the utilities' obligation to their communities, were discussed at the second annual joint convention of the Wisconsin Utilities Association at the Hotel Pfister, Milwaukee, April 17-18.

The most important paper of the convention was perhaps that prepared by Halford Erickson, vice-president of the Byllesby Engineering & Management Corporation, on the subject of state ownership and operation of water powers. In Mr. Erickson's absence this paper was read by J. W. Devereaux. Mr. Erickson argued convincingly that since hydro-electric power requires an investment per kilowatt of $250 and over, it would be undesirable to develop the remaining 250,000 hp. in the Wisconsin rivers by state control. He favored the present Wisconsin water-power law, enacted in 1915, which was based on long experience with other laws in other states. Figures were quoted from a study made by Professor Lincoln of Harvard University on seventeen municipally owned and seventeen privately owned utility plants in Massachusetts. These showed a greater cost by 33 per cent for generating energy by municipal ownership.

The first report of the women's public information committee was presented by Miss E. M. Westenhaver of Beloit, who told of the work in organizing thirty-three women's information bureaus in the fifty-six Wisconsin utility organizations.

The right to occupy highways was considered by Adolph Kanneberg, Wisconsin Railroad Commission. Because utilities are rendering a great service to communities by the distribution of their products, he said, they do have an inherent right to occupy highways unless their equipment is erected where it unreasonably interferes with abutting properties and hinders free traffic. Mr. Kanneberg quoted several legal decisions showing that the right to occupy highways has been construed to allow the greatest use of utility service, but that the manner in which poles or tracks are set may constitute an additional burden upon a community and call for compensation.

Electric and Commercial Sessions

The electric session on Thursday afternoon was given over to a paper by C. C. Jackson on "wired wireless," to tests of the Fynn-Weichsel motor and to a discussion of interconnection of electric power systems. Mr. Jackson described the wired wireless of the Consumers' Power Company in Michigan. In answer to questions regarding operating trouble, he declared that while arcing off grounds interfered with conversation, little trouble was experienced last summer in sending instructions during lightning storms. In order to increase operating distances, he favored the construction of antennas to bypass all air-break switches, transformers, disconnecting switches and circuit breakers.

The tests on the Fynn-Weichsel motor were conducted by Professor Bennett and R. E. Johnson of the University of Wisconsin. Their explanation showed how this motor operates as a synchronous motor with all starting advantages up to 160 per cent full load and then as an induction motor.

Interconnection of electric power systems was discussed by G. C. Neff, vice-president of the Wisconsin River Power Company, who declared that popular fallacies about long transmission lines and very cheap hydro-electric power should be corrected by public utility men. With present interconnections serving as a nucleus for a future superpower system, Mr. Neff thought that more flexible intercompany contracts should be made.

Recent occurrences in administering the electric safety code were discussed by John Hoeveler and C. B. Hayden. It was pointed out that although new construction must necessarily follow the code, manufacturers and utilities are not relieved from making compensation for failures in the present equipment.

In the commercial session F. V. Hazard, in stating reasons why public utility companies should merchandise, asserted that a merchandising department was not merely one selling merchandise, but was also a department for the education of customers.

R. S. Rodenhuis, Wisconsin-Minnesota Light & Power Company, thought that sales campaigns should be directed toward fields in which investigation has shown that low saturation prevails. He considered a prominent display room, good newspaper advertising, effective "follow-up" letters and intensive sales talks for salesmen very effective means for campaigning.

The Utility's Obligation

On Friday morning John F. Gilchrist, vice-president Commonwealth Edison Company, Chicago, outlined in a telling address the utility's obligation to the city, its customers and its employees, both commercially and socially, and lastly to its stockholders. In discussing the last point Mr. Gilchrist said that in Chicago more than $40,000,000 of worthless promotion stock had been sold in 1923 to the unsuspecting public. He considered it a vital duty of utilities to show how they could have used this money effectively in building plants where safety of investment could have been assured. He also stressed the responsibility to inform the public of labor-saving devices and appliances which are a step in the development of the human race.

Dr. Richard T. Ely, director of the Bureau of Land Economics and Public Utilities, said that this bureau is now working along three lines, investigating utility taxation, estimating the necessary credit for public utilities and preparing an educational textbook on land in its relation to public utilities.

"Service the Watchword of Business" was cleverly amplified by W. S. Vivian, Middle West Utilities Company, who talked on public relations. He dwelt on the fact that everybody with an insurance policy or a bank account was directly interested in the earning ability of public utilities.

Marking Poles for Identification

On Friday afternoon E. J. Kallevang made a report on pole identification which favored the stenciling of numbers with paint or the branding of poles in some other way than by the use of metal tags, which were apt to scratch or otherwise injure linemen. It was recommended that a change be made in the code so as to require the numbering of every tenth pole in urban districts where two companies operate.

The report of the rural lines committee, presented by R. J. Walter, was a compilation covering thirty-three rural extensions, showing the income, expenses and connected load and loss data. This report showed that the average percentage of energy loss was more than 47 per cent owing to installing oversize transformers. These thirty-three lines yielded a net revenue of $60,808, leaving an amount available for return and depreciation of $13,730, when actually $43,772 should have been earned on the investment.

Some innovations in electric distribution were recounted by S. B. Hood, Northern States Power Company, in a paper read by George A. Mills. The Northern States company employs a common grounded neutral for both primary and secondary on an alternating-current network. Mr. Hood pointed out the advantages of this system, which saves one wire of four in a four-wire grounded system and one of two wires in an all-single-phase branch lead. In the alternating-current network the outer wires of the secondary section are not solidly tied together, but are joined by means of a copper link fuse which limits the interchange of current to 50 per cent of the capacity of the smallest adjacent transformer. This method automatically sectionalizes the network in case serious faults occur. This system has been extended to the series street-lighting circuit and used for a development of power load. Although some doubt as to its feasibility was expressed by G. G. Post, Milwaukee, and A. J. Goedgen, Mr. Loring of Red Wing, Minn., declared that the system saved $200 a mile on the construction of the 2,300-volt, single-phase experimental farm line extending 6½ miles from Red Wing.

The new officers of the Wisconsin Utilities Association for the coming year are: President, G. C. Neff, Wisconsin River Power Company, Madison; vice-president, L. L. Tressier, DePere Light & Power Company; treasurer, Harrison A. Smith, Southern Counties Power Company; chairman Electrical Section, M. H. Frank, Eastern Wisconsin Electric Company; vice-chairman, A. J. Goedgen, Menominee & Marinette Light & Traction Company.

Southwest Division Has Busy Sessions

Meeting Jointly with Public Service Association, It Takes Up Present-Day Problems in Aggressive Spirit at New Orleans—Public Relations to the Fore

THE joint convention of the Southwestern Public Service Association and the Southwestern Geographic Division of the National Electric Light Association in New Orleans on April 22 to 25 drew an attendance of about 600. Enthusiasm prevailed, and Southern hospitality and entertainment were again abundantly manifest.

William Pfaff, president of the Association of Commerce, made the address of welcome, to which J. F. Owens, vice-president of the Oklahoma Gas & Electric Company, Oklahoma City, responded. Mr. Owens declared that there is no place for any one in the utility field who is not willing to fulfill his obligation as a trustee of the public interest. J. W. Carpenter, president of the Southwestern Division, N. E. L. A., reviewed the outstanding accomplishments of his association in the past year and emphasized the necessity of consistent, continuous public education; while J. H. Gill, president of the Southwestern Public Service Association, cited new fields of endeavor that have been entered, such as rendering expert accounting service and inauguration of a section to cover small-plant problems.

C. J. Rutland, Dallas, Tex., described how by a systematic campaign to reduce accidents the Texas Power & Light Company has reduced the cost of casualties from 3.6 per cent of the payroll to 0.8 per cent in three years

EMPLOYEE ORGANIZATIONS

In presenting the committee report on employee organizations, C. J. Rutland said that public utilities in the past have not taken the precautions to safeguard their investment in men that they have taken to safeguard their investment in equipment. He called for a more intimate relationship between employer and employee. J. F. Owens, Oklahoma City, advocated group insurance. His company insures employees who have been in service six months for $500 and those in service one year for $1,000, payable $200 on death and the remainder in monthly instalments. D. A. Hegarty, Brush Electric Company, Galveston, Tex., said that his company substitutes its own securities for insurance. Employees of the Texas Power & Light Company, according to J. E. Van Horn, are assessed for insurance premiums—65 cents per month for linemen and 50 cents for others. Financial aid is also given employees in buying homes, and preferred stock is sold them for $5 down, the total cost being spread over nineteen months.

M. H. Aylesworth, managing director N. E. L. A., asserted that the public has not been sufficiently educated regarding the small part which production expense bears to total delivery cost, the magnitude of taxes paid by utilities, the dependence of greater development on the elimination of unjust restrictions, and the fact that government does not pay adequately to attract talent and that talent doesn't care to associate itself with politics.

The public relations activities of the state committees in Mississippi, Louisiana, Texas and Arkansas were explained by H. M. Blain, George McQuaid, Earle W. Hodges and E. F. McKay. Among the accomplishments have been the establishment of question and answer sections relating to utility service in leading newspapers, distribution of suggestions for local publicity, offering of prizes to school children for essays regarding utilities, inauguration of district committees to carry on local activities, "get-together" meetings with groups of influential persons and the circulation of educational literature.

STANDARD URGED FOR PUBLIC RELATIONS

G. W. Fry, chairman of the Public Relations Section, Southwestern Division, urged the general acceptance of some standard by which the public relations of any utility can be measured, public understanding, appreciation and friendship being the important factors.

Work of the women's public information committee, of which Rose K. Perry, San Antonio, Tex., is Southwestern chairman, constituted no small part of the past year's public relations work. In one year this committee has enlisted the support of five hundred women and organized thirty local committees.

Two commercial topics were discussed at the Commercial Section meeting—"Are Merchandise Discounts Large Enough to Permit a Fair Profit?" and "Domestic Electric Refrigeration." W. J. Aicklen, Jr., New Orleans, maintained that it is the unusual amount of advertising, plus personal calls, sales on deferred payments and continuous service after an appliance is sold, that makes a 35 per cent gross profit insufficient. Since manufacturers are opposed to increasing list prices and cannot afford to give bigger discounts, utility companies will have to increase their net profit by minimizing their merchandise stock, he said, handling only one or two of the highest-quality types in each line and selling from house to house through trained salesmen paid on a salary-plus-commission basis.

The opinion was expressed by several that advantage would not be taken of an increased "spread" if it were afforded, because prices would be cut to get more business. There was some difference of opinion whether utilities should sell appliances purely on a merchandising basis or chiefly to increase domestic load. H. Jalonick, Dallas, contended that the cry of insufficient profit would be greatly overcome by more aggressive salesmanship.

Household refrigeration, declared W. E. Clement, New Orleans, is by far the most desirable load which can be developed on residence lines, since it can be acquired with practically no increase in fixed charges. The perfection of the equipment is of first importance, and the present high cost is a bar to progress. Lower prices should be possible when production can be conducted on a greater scale. Data were cited indicating a yearly consumption of 680 kw.-hr. for refrigeration and 524 kw.-hr. for appliances and lighting in the average eight-room Southern home. Service complaints, it was pointed out, average about 2.7 per customer per year and are due chiefly to thermostat and mechanical troubles.

B. Howard, Dallas, anticipated a great future for domestic refrigeration, but said that at present too much servicing is required because of refrigerants, cost of cooling water, too small motors and other things. Mr. Holland, Dallas, declared that refrigerators consume about as much energy per day as electric ranges and are consequently being served at the same rate in Dallas.

The year's work of the Technical Section had been chiefly to assist the national committees, its most important accomplishments being the compilation of construction, operating and maintenance data on oil and gas engines and a study of rural line construction and problems of serving farmers.

Arrangements for furnishing expert accounting service and preparation of a simplified classification of accounts and forms to use were the chief work of the Accounting Section.

Says Congestion of Streets Hampers "Electrics"

The effect of traffic conditions on the business of the great cities and the part that this plays in the market for electric street and industrial trucks were graphically described by Major E. C. Church, transportation engineer of the Port Authority of New York, at the monthly luncheon of the New York Electrical League at the Hotel Astor on Wednesday. This was a joint meeting of the league and the Electric Vehicle Association of New York and was attended by five hundred men.

At the present time terminal and incidental costs of moving freight are from ten to thirteen times the cost of the line haul on the railway, according to Major Church, and so great is this burden that it imposes an annual expense of $100,000,000 on the people of New York. At the present time the average load of a truck in New York City is 1½ tons, and owing to the congestion this truck travels only five or six miles in an average day and is in motion but two or three hours of that time at a cost of 6 cents a minute for a motor truck. The future of electrical transportation and freight handling by electrical methods is dependent principally on these conditions of traffic being made more favorable. The characteristics of the electric truck give it specific advantages under present street conditions, but the length of time each truck stands waiting in the large cities at present makes the cost of the equipment a large factor in the expense of hauling and causes the continuation of the use of the horse. There is no lack of electrical freight-handling machinery available, Major Church said. The chief problem of the electrical industry is how to aid in the betterment of traffic conditions.

A memorial service to Walter Neumuller, late past-president of the league, with an address by James M. Wakeman, preceded the program.

Fight Over City Ownership in Colorado Springs Is Hot

The fight in Colorado Springs, Col., over the municipal lighting-plant issue, which, as already stated in the ELECTRICAL WORLD, will be decided at a special election on May 20, shows indications of becoming a bitter one. Oliver H. Shoup, former Governor of the state, is leading the opposition and has formed a voluntary committee of taxpayers which already numbers over 500. The campaign of this group is founded upon education in order that citizens may not be confused over the issues of the election. Newspaper advertising of the committee emphasizes the point that it does not represent the existing central-station company, to which a renewed franchise was refused, and that the issue is rather one of unnecessary taxes and the danger of an era of political dissipation. The local newspapers are also opposing the municipal project.

Ralph O. Giddings, a prominent merchant, has been named chairman of a committee in favor of municipal ownership, and this group has the backing of the City Council. Campaign offices have been opened by each side. and even money is being wagered.

Financial Statement of Electric Bond & Share Company

The financial statement of the Electric Bond & Share Company for December 31, 1923, shows current assets of $26,148,134, investments of $21,584,658 and syndicate holdings and advances of $14,773,210. Current and syndicate liabilities amount to $1,934,921, preferred stock to $22,400,000, common stock to $22,800,000, reserves to $683,071 and surplus to $14,734,385. The gross income for 1923 was $11,410,693 and the net income $7,469,358. Preferred dividends and common stock dividends were $1,123,191 and $1,399,609 respectively. The accumulated income since March 15, 1905, is $9,736,053.

Annual Report of Standard Gas & Electric Company

In the annual report to the stockholders of the Standard Gas & Electric Company President H. M. Byllesby states that the net revenue of the company for 1923 was $5,103,425, compared with $4,652,126 in 1922. Gross earnings of the operated public utility companies for 1923 were $46,165,533 and net earnings were $18,711,033. These figures represent an increase in gross earnings of 9.72 per cent and an increase in net earnings of 16.4 per cent over 1922.

By certain changes in the capital structure of the company, authorized at a special meeting of the stockholders March 19, 1924, the proportion of funded debt to the total capitalization will be reduced and eventually the company will have no secured funded debt. The construction budgets of the operated utility properties for 1924 are estimated at $32,672,000, representing additions and extensions required to serve additional public demands. New construction in 1923 required an expenditure of $31,471,106.

The customer-ownership policy of the operated companies was continued with success, these companies now having well over fifty-thousand customer or local shareholders. During 1923 the number of communities served by the operated utility companies increased from 665 to 841. Installed steam and hydro-electric horsepower increased from 418,472 to 630,847, and the companies now own and operate more than 12,700 miles of electric lines.

American Power & Light Company Report for 1923

Earnings of the American Power & Light Company for the year 1923, according to a preliminary statement, show an amount applicable to common stock (including undistributed earnings of subsidiary companies) equal to 24 per cent on the $13,239,456 common stock outstanding at the end of the year and equal to 28 per cent on the average amount of common stock outstanding during the year. These earnings are after the deduction by the subsidiary companies of $2,055,191 transferred to renewal and replacement (depreciation) reserve.

During the year the company paid dividends aggregating $844,425 on its 6 per cent cumulative preferred stock and $1,626,651 on its common stock. The dividends on the common stock consisted of 10 per cent in cash and 4 per cent in common stock. The combined undistributed income for the year of the American Power & Light Company and its subsidiaries, after the payment of dividends and the deduction of the amount transferred to renewal and replacement (depreciation) reserve, was $1,558,242.

Cities Service Has Increased Utility Earnings

The report of the Cities Service Company for 1923, which has just been issued, shows a substantial increase in earnings over the preceding year. The gross earnings were $16,602,562, as compared with $14,658,971 in 1922. Gross earnings of Cities Service Company which came from public utility subsidiaries alone increased 35 per cent, to $11,278,508, from $8,347,546 in 1922.

In directing the attention of stockholders to this phase of the company's work, Henry L. Doherty said:

"The importance of the diversity of the investments of the company is again shown by the continued improvement in the utility earnings in a year when the oil business had to deal with difficult conditions. The sales of gas and electricity by the subsidiaries were the largest in their history. The kilowatt-hour sales were 993,913,613, an increase of 14.8 per cent. The total manufactured and natural gas sales were 47,399,948,000 cu.ft., an increase of 6.3 per cent."

The earnings from utility properties alone were not only sufficient to take care of all expenses, interest charges and the preferred dividend, but also provided a substantial balance for the common stock.

During the year utility properties were acquired in Athens, Ga., and Adrian, Mich., and two important properties were added to the natural-gas system in the mid-continent group—the Consumers' Light, Heat & Power Company, operating in Topeka and Oakland, Kan., to be known hereafter as the Capital Gas & Electric Company, and the Union Public Service Company, a holding company operating natural-gas systems in Kansas and Oklahoma.

Four Hundred Electric Vehicles in New York City Parade

ABOUT four hundred electric vehicles of every type took part in the annual parade in New York under the auspices of the New York Edison Company last Saturday, which passed down Fifth Avenue from Sixtieth Street to Washington Square. Many of the trucks were equipped with radio sets, and music was broadcast as the procession moved. The parade, which contained forty trucks that had seen service of ten years or more—one nineteen-year-old veteran belonging to the Berlin & Jones Company having traveled 180,000 miles — was viewed from the balconies of the Hotel Brevoort by prominent designers, manufacturers and users of electric vehicles. It marked the formal opening of the New York Electric Truck Show in the showrooms of the New York Edison Company, at Irving Place and Fifteenth Street, which continued all this week.

Twin Cities' New Plants

Three Steam Stations and One Hydro Will Produce 133,000 Hp. and Cost $15,000,000

THROUGH the expenditure of more than $15,000,000 to develop 133,000 additional electrical horsepower at four large plants under construction in a three-mile area along the Mississippi River, Minneapolis and St. Paul have the distinction of carrying on the greatest steam-electric power development west of Chicago and the largest power development of any kind between Chicago and California. Water power is to be used in developing 18,000 hp. of the additional generating capacity, the remainder to be produced in steam plants. This large accession of electrical energy has been necessitated by the rapid industrial expansion of the Twin Cities.

As previously announced in these columns, the Northern States Power Company is building an 80,000-hp. plant to be operated by steam, costing $10,000,000, which will have 40,000 hp. available in June and the remainder in August.

The Ford Motor Company at its Twin City plant at the High Dam is completing an 18,000-hp. plant to be operated by water power at a cost of $2,200,000, and the first of this power will be available in June. This plant will be completed in advance of the factory which the Ford company is building adjacent to the development. Under the terms of the lease of this power to the Ford company by the Federal Power Commission all surplus energy not used in the new factory is to be delivered to the Northern States Power Company for distribution in Minneapolis, St. Paul and surrounding territories. Therefore, after the power plant is placed in operation, which is expected to be not later than June, all power developed will be delivered to the company pending completion of the Ford factory. The lease also provides for distribution by the Northern States company of power in excess of the normal operating requirements of the factory. As the amount of power generated varies with the stream flow, it is impossible to estimate in advance what the excess will be.

The Ford company has also begun construction of a 5,000-hp. plant, which will cost $800,000 and be operated by steam, with provision to enlarge to 10,000 hp., and this will be finished next winter.

GAS LIGHT COMPANY'S STATION

Work began last month on a 25,000-kva. steam-electric power plant for the St. Paul Gas Light Company, to be known as the "Island" station. The structure is being built on the island in the Mississippi River west of the High Bridge and rests on 1,500 wooden piles. There will be three Heine water-tube boilers of 1,044 hp. each and 10,440 sq.ft. of heating surface, 325 lb. operating steam pressure, equipped with six burners each for pulverized fuel. The water of the boilers will be air-cooled. The turbo-generator is a 25,000-kva., 13,200-volt, three-phase, 60-cycle, four-pole, 1,800-r.p.m. Westinghouse type, with a 25,000-sq.ft. condenser, steam pressure at the throttle 275 lb., 236 deg. F. Low-tension switches will be on the lower floor with cables on the second floor. High-tension switches are placed on the third floor while the control or switch room will occupy the top floor. This station is to cost $2,000,000 and will, it is expected, begin production by August 1.

All of the new plants are along the navigable waters of the Mississippi River. When their combined capacity is added to that formerly installed and the power generated at St. Anthony Falls is also added, Minneapolis, St. Paul and the tributary district will have total electrical generating installations rated at 450,000 hp. The Northern States Power Company is completing a "loop" transmission line around the two cities. (See ELECTRICAL WORLD, February 2, page 250.)

Congress Grants Extension to Dixie Power Company

Consideration for the small investors who own most of the stock of the Dixie Power Company was the influence behind the passage by the Senate and the House of a bill extending for eighteen months beyond the three-year limit the preliminary permit of the company covering a site on White River in Arkansas. The conflict between the Dixie Power Company and the Hugh L. Cooper company over this site has already been recounted in these columns.

No opposition to the bill was offered by the Federal Power Commission. O. C. Merrill, the executive secretary of the body, rather reluctantly refrained from interposing objections, because circumstances in this particular case are not likely to arise again.

Rochester Gas & Electric's Future Plans

Four hydro-electric plants on the Genesee River and a new steam station will probably be built and in operation by the Rochester Gas & Electric Corporation in the next twenty years, according to the year book of that utility, which has just been issued. The present question, says the company, is to determine which of these plants shall be the first undertaken. Six considerations will govern—cost of coal, possibilities of the mercury turbine and the hoped-for internal-combustion turbine, cost of capital, cost of materials and labor, market for exhaust steam for industrial heating, and the possibilities of the purchase of reasonable energy when made available from the St. Lawrence and from further development at Niagara.

One choice is between a new steam station and regulation of the Genesee by building a storage reservoir above the village of Mount Morris to permit another hydraulic development. The initial cost of the regulation would be eight or nine million dollars as against two million for the steam plant, but the latter would burn half a million dollars' worth of coal annually. A number of other alternatives are alluded to, and the Rochester corporation remarks that its problem would be simpler if it did not have such a wealth of resources to draw upon. It now derives power from three major sources—its Genesee hydro-electric plants, its steam stations and its connection with the Niagara, Lockport & Ontario Power Company, which supplies about one-sixth of the Rochester corporation's requirements by means of energy generated at Niagara Falls.

Briefer News

Atlantic City and Cape May Companies Merge.—The New Jersey Board of Public Utility Commissioners has approved the merger of the Atlantic City Electric Company, the Cape May County Electric Company, the Cape May Light & Power Company and the West Jersey Electric Company. These companies have a combined valuation of more than nine million dollars.

Annual Arkansas Meeting to Be in June.—Instead of having its annual convention in the fall, the Arkansas Utilities Association will hold its meeting on June 12, 13 and 14 at the Hotel Eastman, Hot Springs, Ark. Public relations, customer ownership, taxation or related subjects will be the major subjects discussed, and noted speakers from out of the state are expected.

Virginia Railway & Power Absorbs Roanoke Property.—Thomas S. Wheelwright, president of the Virginia Railway & Power Company, Richmond, Va., has announced that his company has acquired by purchase the plant and properties of the Roanoke Rapids Light & Power Company, Roanoke, Va., for a consideration of approximately $1,000,000.

Radio "Fans" Fight Arc Lights.—Declaring that arc lights interfere with wireless messages, radio devotees in El Paso, Tex., have induced the City Council to postpone calling for bids for lights for the new "white way" until tests can be made. J. T. Burke, president of the El Paso Radio Club, protested that "after an arc light has burned a short time a chattering is produced which throws out a carrier wave." "One lamp would interrupt radio communication within a radius of four or five blocks, and four hundred would affect the entire city," he said.

To Survey the Tennessee.—The House rivers and harbors committee has agreed to include in the new rivers and harbors bill on which it is working an authorization for a survey of the Tennessee River from Riverton, Ala., to its junction with the Ohio, the cost being estimated at $315,000. No appropriation will be made until next year. The survey will be both for purposes of improvement of navigation and

for possible sites for hydro-electric development, the power possibilities in the lower Tennessee being declared to be greater than those at Muscle Shoals.

Skagit Opening Again Delayed.—The Gorge Creek tunnel in the Skagit River development of the city of Seattle will not be completed by May 1, the date previously set for its completion by the contractor. This will further delay the opening of the hydro-electric plant, which was originally set for January 1 last. Several extensions of time have been granted on the tunnel job, and the City Council is undecided as to whether the contractor shall be penalized. The contract provides for a penalty of $500 a day after September 1, 1923.

Omaha to Stage Electrical Exposition.—Omaha is to have an electrical exposition during the first part of November, according to an announcement by J. E. Davidson, vice-president and general manager of the Nebraska Power Company. The city's large municipal auditorium has been reserved for the show, and should this space prove insufficient an adjoining building will also be used. The affair will be one of the largest of the kind ever held in the Central West and will celebrate the fortieth anniversary of the introduction of electricity in the modern sense into Nebraska.

Power Possibilities of the Siuslaw River.—The Geological Survey has recently made an investigation to determine the possibility of developing power in the Siuslaw River basin, which lies west of Eugene, in western Oregon. Without storage, it is reported, the potential power in the basin for 90 per cent of the time is 4,000 hp. and for 50 per cent of the time 31,000 hp. With storage the total potential output is 52,000 continuous horsepower. The potential output of the Siuslaw River itself without regulation amounts to 2,800 hp. for 90 per cent of the time and 23,000 hp. for 50 per cent of the time.

Interstate's Offer for the Richmond (Ind.) Plant Not Favored.—The offer of $1,500,000 for the municipal electric light and power plant at Richmond, Ind., recently made to the city by the Interstate Public Service Company, Indianapolis, will probably receive no further consideration from the City Council, a committee of Richmond business men named by the Mayor to consider the offer having announced that it will make an unfavorable report. It is thought that the Interstate company may make a new offer, and it is also reported that another large power corporation has been investigating conditions in Richmond with a view to making an effort to buy the municipal utility.

Northwest Association Will Convene in Gearhart, Ore.—The seventeenth annual convention of the Northwest Electric Light and Power Association will be held at the Gearhart Hotel, Gearhart, Ore., on June 25, 26 and 27. The tentative program calls for addresses on the first day by President George L. Myers, Franklin T. Griffith and M. H. Aylesworth of the N. E. L. A. and John A. Laing, vice-president and general attorney of the Pacific Power & Light Company. Mr. Laing's subject will be "The Indeterminate Permit." Public relations will occupy the second day, and accounting, commercial and technical sessions the third, with an executive session in the evening.

Experimental Farm Electrification in Wisconsin.—As the outcome of a conference called at Madison, Wis., by Dean H. L. Russell of the State College of Agriculture an experimental electrified farm will be established somewhere in the vicinity of Madison, where studies will be made to determine the practical value of electric service to the farmer. Prof. F. W. Duffee will be in charge of this work, which will be controlled by a Wisconsin Committee on Application of Electricity to Agriculture, of which Dean Russell will be chairman. John C. Cadby will represent the Wisconsin Utilities Association on this committee and G. C. Neff the national committee pursuing the same objects.

Initial Development on Chattahoochee Will Be 30,000 Kw.—Plans and specifications for the hydro-electric development at Bartlett's Ferry, 16 miles from Columbus, Ga., on the Chattahoochee River, already announced in these columns, are being prepared by Stone & Webster at the instance of the Columbus Electric & Power Company. The plans call for a dam 120 ft. high with provision for an ultimate installation of 60,000 kw. and an initial plant of two 15,000-kw. units. The estimated cost of the initial development is $6,000,000. R. M. Harding is local manager, and the company is under the general management of Stone & Webster.

Explaining the Storage Battery.—The principles of operation of the storage battery are made clear to the layman in a new industrial motion picture, "The Story of a Storage Battery," just prepared under the direction of the Department of the Interior, with the co-operation of the Willard Storage Battery Company. The film illustrates all details in the construction of an electric storage battery, its workings and its proper care. It will be available for distribution about April 1, under the free loan service of the Bureau of Mines, and requests for the loan of the film should be addressed to the Bureau of Mines Experiment Station, 4800 Forbes Street, Pittsburgh.

Great Western Earnings Shown.—In its statement to the Railroad Commission the Great Western Power Company, San Francisco, reports for the year 1923 that its operating revenue was $6,887,622 and operating expenses $1,886,460, giving a net operating revenue of $5,001,162. Miscellaneous non-operating revenue amounted to to $52,331. Interest, rent, taxes and other deductions totaled $3,610,849. The net corporate income for the year was $1.442,643. The surplus at the beginning of the year amounted to $5,946,696. Miscellaneous additions to surplus for 1923 amounted to $130,691, and miscellaneous deductions were $1,561,988. The company declared dividends of $920,718 during the year, leaving an accumulated surplus on December 31 of $5,037,325.

British Government to Operate Imperial Radio System.—The Imperial Wireless Telegraph Committee, appointed by the British government, has now decided that the chain of wireless stations linking the empire will be operated by the government and not by a private company. Until lately the Marconi company hoped to get the government monopoly. The first scheme for a chain of empire communications was put forward by the wireless committee presided over by Sir Henry Norman in 1920. It proposed steps about 2,000 miles apart, embracing India, Canada, Australia, South and East Africa, Singapore and Hongkong. The committee recommended government ownership, but public opinion is still divided on this point.

Broader Aspects of Accounting to Be Discussed at Boston.—The contact of accountants with executive and public relations problems in the public utility industry will form the theme of a meeting of the Accounting Section of the New England Division, N. E. L. A., at the Hotel Vendome, Boston, April 30, starting with a luncheon at 12:30 p.m. Papers will be presented as follows: "The Financial Report to the Manager—What it Should Contain," L. H. Blount, Narragansett Electric Lighting Company, Providence; "Relations Between the Operating Departments and the Accounting Departments of a Public Utility," E. S. Mansfield, Edison Electric Illuminating Company of Boston, and "Do Our Merchandising Departments Pay from a Business and Accounting Standpoint?" R. D. Cutler, Hartford Electric Light Company.

Providence Engineers Listen to Forecasts by Public Utility Men.—Public utility developments expected during the next decade were outlined before the Providence (R. I.) Engineering Society at a meeting on April 15, the speakers being W. B. Spencer, assistant to the president United Electric Railways Company; E. W. Longley, vice-president New England Telephone & Telegraph Company, Boston; C. E. Paige, vice-president Charles H. Tenney & Company, Boston, and Don C. Galusha, electrical engineer Dwight P. Robinson & Company, New York. The last speaker predicted that the development of the mercury boiler and application of the vacuum tube to power engineering will stand out in the record of central-station progress in the coming ten years.

Accident Prevention a Public Utility Service.—How the modern public utility is aiding the general welfare by its leadership in accident-prevention work was the theme of an all-day conference, with a registration of 225, on April 16 at Boston, under the auspices of the accident prevention committee of the

New England Division, N. E. L. A. Frank W. Randall, chairman, presided at a morning session which was addressed by H. B. Harmer, Philadelphia Electric Company; A. J. Van Brunt, Public Service Electric Company of New Jersey; A. W. Devine, lighting specialist, Massachusetts Motor Vehicle Registry, Boston, and W. M. Harris, American Red Cross, Boston. Following a luncheon at the general service buildings of the Edison Electric Illuminating Company of Boston, where the conference was held, a round-table discussion took place under the chairmanship of Herbert W. Moses of the Boston company.

Fourteen Thousand Shares in Tomadelli Corporation Sold.—Hearings so far in the application brought by the State of New York against the Tomadelli Electronic Light Corporation, which claims to be developing a process by which cold electric light bulbs of from 25 cp. to 2,000 cp. can be made to burn for three years by self-sustained electricity, have brought out that $136,000 has been paid by the public for 14,000 shares of stock. The company's present bank balance was put at less than $40, and it was admitted that no lamps had been manufactured for sale. Single shares of stock were sold by promoters for as much as $100. On behalf of Tomadelli it was asserted that he had never claimed his invention was perfected. The contention was put forth that the public had bought the stock understanding this and in the hope that the lamp would be made commercially successful.

Another Wisconsin Merger—One of the largest mergers in the history of the public utility industry in Wisconsin, involving seven companies furnishing electric, gas, city and interurban railway and bus service in many communities throughout the southeastern part of the state, was effected on April 16 by permission of the Wisconsin Railroad Commission, and the consolidated companies will be henceforth operated under the name of the Wisconsin Power & Light Company. The corporations consolidated are the Eastern Wisconsin Electric Company of Madison, Badger Electric Company, Janesville Electric Company, Wisconsin Power, Light & Heat Company, Mineral Point Public Service Company, Wisconsin Utilities Company and the Middle Wisconsin Power Company. A bond issue of $2,115,900 was authorized to provide funds for taking over the plants.

Figures for Building Municipal Plant Go Up 400 per Cent.—Engineering testimony given before the Colorado Public Utilities Commission on the application of the city of Loveland for permission to build a municipal plant put the first cost at $425,000, instead of the $100,000 originally thought sufficient by some of the promoters of the plant. Charles A. Semrad, vice-president of the Public Service Company of Colorado, which now supplies Loveland with electricity, said that the city's plans are economically and physically impracticable. If the city goes through with its plans to build and operate the plant, he said, it will cost it in fifteen years $1,038,171. Dean H. S. Evans of the University of Colorado Engineering School said that to carry out the city's plans to pay for the plant in fifteen years the citizens of Loveland would have to assume an average increase in all classes of rates of at least 36 per cent over those now in force.

A Pioneer Incandescent Lamp.—An article by H. Beckmann in the *Elektrotechnische Zeitschrift* of recent date asserts that twenty years before Edison brought out his first incandescent lamp Henry Goebel, a German optician living in New York, had successfully operated lamps containing a carbon filament in a vacuum. The filaments were made of fine strips peeled from a bamboo cane. Goebel, the writer says, displayed his electric lamps on a horse-drawn cart which he drove around the streets, inviting passers-by to look at the heavens through a small telescope mounted on the vehicle. These lamps were energized from a sixty-cell primary battery, the only source of electric power that was obtainable in that period.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations is published in the first issue of each volume. See January 5 issue, page 72, for latest list.]

Nebraska Section, N. E. L. A.—Omaha, May 8-9. H. M. Davis, Bankers' Life Bldg., Lincoln.

National Electric Light Association—Atlantic City, N. J., May 19-23. M. H. Aylesworth, 29 West 39th St., New York.

National Electrical Credit Association—Chicago, May 22-23. F. P. Vose, 1347 Marquette Bldg., Chicago.

American Society of Mechanical Engineers — Spring meeting, Cleveland, May 26-29. C. W. Rice, 29 West 39th St., New York.

Electric Power Club — Seaview Golf Club, Absecon, N. J., May 26-29. S. N. Clarkson, B. F. Keith Bldg., Cleveland.

Electrical Supply Jobbers' Association—Homestead Hotel, Hot Springs, Va., June 4-6. Franklin Overbagh, 411 South Clinton Street, Chicago.

American Association of Engineers—San Francisco, June 11-13. C. E. Drayer, 63 East Adams St., Chicago.

Canadian Electric Association—Ottawa, Ont., June 11-13. Louis Kon, 311 Power Bldg., Montreal.

North Central Division, N. E. L. A.—Winona, Minn., June 11-13. H. E. Young, Minneapolis General Electric Company, Minneapolis.

Arkansas Utilities Association—Hotel Eastman, Hot Springs, Ark., June 12-14. R. I. Brown, Arkansas Central Power Company, Little Rock.

Associated Manufacturers of Electrical Supplies—Hotel Ambassador, Atlantic City, N. J., June 16-20. Frederic Nicholas, 30 East 42d St.

Pacific Coast Electrical Association—Hotel Coronado, Coronado, Cal., June 17-20. S. H. Taylor, 527 Rialto Bldg., San Francisco.

Georgia Electrical Association—East Lake Country Club, Atlanta, June 18-19. W. C. Drake, 75 Marietta St., Atlanta.

Empire State Gas and Electric Association—Commercial Section, Buffalo and Niagara Falls, June 19-20. C. H. B. Chapin, Grand Central Terminal, New York.

Wyoming Utilities Association—Casper, Wyo., June 23-24. H. C. Chappell, Natrona Power Company, Casper.

American Institute of Electrical Engineers — Annual convention, Edgewater Beach (Chicago), June 23-27. F. L. Hutchinson, 33 West 39th St., New York.

Society for the Promotion of Engineering Education—University of Colorado, Boulder, Col., June 25-26. F. L. Bishop, University of Pittsburgh, Pittsburgh.

Puget Sound Company's Sultan River Plant. — The Puget Sound Power & Light Company will start construction on its Sultan River power plant in the immediate future according to an announcement following the issuance of a permit for the appropriation of water by the state Supervisor of Hydraulics. The development will cost about $600,000 and the power will be used to supply the towns in Snohomish County, Wash. The plant will develop about 4,000 hp. under a head of 100 ft.

Pacific Gas & Electric Substations.—A substation is to be built in Antioch, Cal., by the Pacific Gas & Electric Company in order to improve the supply of energy in the industrial area between Antioch and Bay Point. Fifty-five acres of land have been purchased for a site, and construction is to begin by early fall and be completed early next year. When Pit River station No. 3 comes in, the Antioch substation will take power at 110,000 volts from the huge Vaca-Dixon substation and distribute it at 60,000 volts, thus forming an important link in the Pit River distribution chain. In addition, the company's substation at Mountain View, Santa Clara County, is to be rebuilt at a cost of $138,000 to take care of the increased irrigation load. The company will also spend $125,000 in Berkeley, where a six-way underground conduit system will be laid to tie in with the Berkeley and Oakland substations and provide additional energy for the growing needs in a rapidly expanding area.

Large Impulse Unit to Go in Big Creek No. 1.—What is believed to be the largest impulse hydraulic prime mover yet constructed will be installed in Big Creek power house No. 1 of the Southern California Edison Company during the latter part of this year. The unit will be built by the Pelton Water Wheel Company of San Francisco. It will be a double-overhung horizontal-impulse wheel capable of developing 35,000 hp. under a net effective head of 1,900 ft. This installation is in addition to three previous units of 22,000 hp. each and will bring the total capacity of the plant up to 99,300 hp. The capacity of Big Creek No. 2 will also be increased by 22,500 hp. through the installation of another Pelton impulse wheel of this rating operating under an effective head of 1,780 ft. One feature of particular interest in connection with the 35,000-hp. unit will be the special design of the lower housings, disk rings and hubs, which will permit of the changing of all parts of the waterwheels with a minimum loss of operating time. Replacement of parts can be quickly accomplished, or the prime mover may be changed over from 50-cycle to 60-cycle operation through the use of interchangeable parts which will be supplied.

Men of the Industry

Changes in Personnel
Accomplishments, Responsibilities, Honors, Appointments and Activities of Men Engaged in all Branches of the Electrical Industry

G. C. Neff Elected President of Wisconsin Association

Grover C. Neff, vice-president in charge of operation of several Wisconsin light and power companies, subsidiaries of the Middle West Utilities Company, was elected president of the Wisconsin Utilities Association at its convention held last week in Milwaukee. Mr. Neff's long and prominent connection with the electrical industry in Wisconsin made him the natural choice for the presidency of the state association. Soon after his graduation from Purdue University in 1907 he entered the utility field as a resident engineer on construction work in Wisconsin. In 1910 he was made superintendent of the Southern Wisconsin Power Company, four years later becoming general superintendent of the Southern Wisconsin Power Company and the Wisconsin River Power Company. Subsequently to these duties were added those of general superintendent of the Wisconsin Power, Light & Heat Company and Central Wisconsin Utilities Company, the Mineral Point Public Service Company and the Janesville Electric Company, and more recently Mr. Neff was appointed to the office of vice-president of these companies in addition to the Eastern Wisconsin Electric Company. He has been active in N. E. L. A. committee work as well as in the state association and is also a member of the A. I. E. E. and past-chairman of its Madison (Wis.) Section.

G. C. NEFF

George H. Stack, formerly secretary-treasurer of the Utica (N. Y.) Gas & Electric Company, is now vice-president and secretary. In the office of vice-president Mr. Stack is succeeding the late M. Jesse Brayton.

L. F. Griffith, formerly superintendent of light and power of the Arkansas Central Power Company, Little Rock, Ark., has become assistant superintendent of distribution with the New Orleans Public Service, Inc. Mr. Griffith was connected with the Arkansas company for about ten years, serving in the meter, armature-winding and engineering departments before reaching the position he recently gave up to go to New Orleans.

F. C. Shenehon Resigns

F. C. Shenehon, whose position as chief engineer of the Byllesby Engineering & Management Corporation H. W. Fuller has been selected to fill, resigned to reopen his offices in Minneapolis as a consulting hydraulic engineer. Mr. Shenehon is widely known in the hydraulic field, with which he was actively associated from 1888 until 1909, when be became the head of the College of Engineering at the University of Minnesota, from which he had been graduated in 1885. He remained at the university until 1917, subsequently affiliating himself with the Minneapolis Gas & Electric Company as construction engineer before joining the Byllesby organization last year.

H. W. Fuller, who has been vice-president in charge of operation of the Northern States Power Company, has been appointed chief engineer of the Byllesby Engineering & Management Corporation, succeeding Francis C. Shenehon, resigned.

Walter De L. Carr, who has been superintendent of the Hammond district of the Northern Indiana Gas & Electric Company for the past four years, has been appointed general superintendent in charge of operating, engineering and construction.

Dr. Robert A. Millikan of the California Institute of Technology, recently awarded the Nobel prize for physics, lectured before the American Chemical Society, which met in Washington recently, and is now spending several days in New York previous to sailing for Europe, where the prize will be formally presented to him.

T. Lee Miller of New York has been appointed assistant to T. H. Tutwiler, president of the Memphis Power & Light Company. Mr. Miller, a graduate of Cornell University in mechanical engineering, has had broad experience in public utility work and industrial enterprises which particularly fits him for the work he is undertaking. Following his graduation from Cornell, he became connected in 1911 with the Toledo Railway & Light Company, with which he was associated for three years, and during the past five years he has been engaged in industrial work.

S. W. Greenland Leaves Fort Wayne

Samuel W. Greenland, vice-president and general manager of the Indiana Service Corporation, Fort Wayne, Ind., has resigned to become the representative of Newman, Saunders & Company, Inc., New York, in St. Louis, where he will assist them in their work as agents of the reorganization committee of the United Railways. The resignation of Mr. Greenland marks the withdrawal from the central-station field of an executive who has taken a prominent part in the activities of the electric light and power industry, including its representative associations. He has been in Fort Wayne since 1911, when the Wabash Valley Traction Company was reorganized to become the Fort Wayne & Northern Indiana Traction Company, Mr. Greenland being made assistant general manager. Later he was promoted to the position of general manager. Four years ago the company was reorganized into the Indiana Service Corporation, and he was made vice-president and general manager of the new organization.

S. W. GREENLAND

Born at Clarion, Pa., in 1879, Mr. Greenland was educated at the Pennsylvania Military College and at the Pennsylvania State College. He entered the public utility field in the service of the American Telephone & Telegraph Company in the Pittsburgh district, later affiliating himself with Robert W. Watson, consulting engineer, Harrisburg, Pa. At one time before going to Fort Wayne he was general manager of the Columbus (Miss.) Railway, Light & Power Company. Mr. Greenland is a past-president of the Indiana Electric Light Association, a member of the American Institute of Electrical Engineers and of the American Society of Mechanical Engineers. He assumes the duties of his new office on May 15.

H. H. Jones, for the past fourteen years president and general manager of the San Diego (Cal.) Consolidated Gas & Electric Company, has gone to Minneapolis as vice-president of the Northern States Power Company in

charge of operations in Minnesota, North and South Dakota, Wisconsin, Illinois and Iowa. Mr. Jones is succeeding H. W. Fuller, who recently joined the Byllesby Engineering & Management Corporation.

F. M. Barber, formerly manager of the Oakfield (Wis.) Telephone Company, has been appointed manager of the Eastern Wisconsin Electric Company at Oakfield, succeeding E. N. McKnight, who recently assumed larger responsibilities.

E. N. McKnight, who has been representative of the Eastern Wisconsin Electric Company at Oakfield, has been promoted to be representative of the power and light interests of the company in Fond du Lac County and in the western part of Sheboygan County.

R. B. Harlan has resigned his position as power-plant superintendent with the Keystone Power Corporation, Ridgway, Pa., to take up his former duties with the American Engineering Company. Mr. Harlan has been identified with the Keystone corporation for about a year and a half.

E. M. Ashworth, who has served as secretary and assistant general manager of the Toronto Hydro-Electric System, has been appointed general manager, succeeding H. H. Couzens, who was recently appointed vice-president of the subsidiary companies of the Brazilian Traction, Light & Power Company.

Eugene E. Stringer, who has been connected with the La Crosse office of the Northern States Power Company as commercial manager, has been appointed acting manager of the company at Chippewa Falls to assume the duties of Albert Smith, who has left for Minneapolis prior to making an extended trip over all the company's properties in the Northwest.

William W. Nielson, assistant general manager of the Springfield (Mo.) Gas & Electric Company and the Springfield Traction Company, has been made assistant general manager of the Tuscon (Ariz.) Gas, Electric Light & Power Company. Both these properties are controlled by the Federal Light & Traction Company.

George E. Learnard, president of the International Combustion Engineering Corporation, New York, returned last week on board the *Berengaria* from a six weeks' inspection tour of the company's properties in England and France. While abroad Mr. Learnard devoted his attention especially to completing the organization of Vickers International Combustion Engineering, Ltd., and other English subsidiaries.

H. C. Hopkins, formerly commercial manager of the Union City (Ind.) Electric Company, has been appointed commercial manager of the Lawrence division of the Kansas Electric Power Company, both companies being operated by the Albert Emanuel Company, Inc., New York. Mr. Hopkins has been associated with the Union City Company for the past six years.

Ambrose Swasey, vice-chairman of the Warner & Swasey Company, machine-tool builders of Cleveland, who was awarded the John Fritz gold medal for 1924, as was announced in the January 26 issue of the ELECTRICAL WORLD, was formally presented with the medal on Wednesday evening, April 23, in the Engineering Societies Building, New York. The ceremony was largely attended by men notable in scientific and engineering circles. This honor, one of the highest bestowed by the engineering profession in this country, goes to Dr. Swasey for achievement as a designer and manufacturer of instruments and machines of precision, a builder of great telescopes, a benefactor of education and the founder of the Engineering Foundation, he being the donor of the initial fund.

C. L. Proctor New Head of Missouri Association

C. L. Proctor, recently elected president of the Missouri Association of Public Utilities, has been vice-president and general manager of the Empire

C. L. PROCTOR

District Electric Company of Kansas at Joplin, Mo., since the fall of 1919. Mr. Proctor was born in Charlotte County, Va., on February 1, 1880, and he was graduated from the Virginia Polytechnic Institute in 1902. After obtaining his mechanical engineer's degree from the graduate school he entered the testing department of the General Electric Company, where he served in the foreign, railway and commercial departments. In 1908 he joined the Athens (Ga.) Railway & Electric Company as general superintendent, remaining there seven years, when he became associated with the Joplin properties of the Doherty interests as manager of the power department. He was transferred to the Danbury & Bethel Gas & Electric Light Company, Connecticut, as vice-president in 1918, where he stayed until his return to Joplin in 1919. Mr. Proctor has been actively interested in association work. He served as chairman of the electric section of the Missouri Utility Association as well as on other Missouri utility committees, having been also prominent in the formation of the Kansas and Missouri public utility information bureaus. Mr. Proctor is an associate member of the American Institute of Electrical Engineers.

Obituary

George L. Wiley, formerly general manager of the Standard Underground Cable Company of New York, died on Wednesday, April 16, at his home in Orange, N. J., in his seventy-sixth year. Mr. Wiley was at one time general manager of the New York Telephone Company and invented several telephonic devices which are still in use. He was a member of the American Institute of Electrical Engineers.

Arthur Warren, well known in the electrical industry twenty years ago and still remembered for his pioneer publicity work, died on April 16 at Hamilton, Bermuda. His name has always been linked with that of George Westinghouse, with whom Mr. Warren was associated for many years in a confidential capacity, having organized for the Westinghouse company a publication bureau whose achievements in the way of corporation publicity as far back as 1898 attracted the attention of the entire industry. Later he became identified with the Allis-Chalmers company in the capacity of manager of publicity. Mr. Warren was an author and journalist of some note, his journalistic connections including twenty-two years with the Boston *Herald* as London correspondent, editorial and special writer and associate editor, and three years on the staff of the New York *Tribune* as dramatic critic. He was sixty-four years of age.

John T. Morrow, consulting engineer, died at his home in Harmon, N. Y., on Friday, April 18. Mr. Morrow was a native of Bangor, Me., and a graduate of Lehigh University in mechanical engineering, later receiving the degree of electrical engineer from the same university. After spending four years with electric companies in the East he went to Great Falls, Mont., where he became superintendent of the Boston & Montana Reduction Works. In 1903 he took the post of general manager of the Greene Consolidated Copper Company at Cananea, Mexico. Removing later to New York, he opened an office there as consulting engineer. In this capacity Mr. Morrow had been identified with many important enterprises for such interests as the General Electric Company and the Bethlehem Steel Company. He was fifty-nine years of age.

H. T. Van Riper, sales manager of the Chicago district of the Edison Electric Appliance Company, Inc., died on Thursday, April 3, in his forty-fifth year. Mr. Van Riper was one of the best-known electrical appliance men in the country, having become identified with the Hotpoint products more than twenty years ago, when they were manufactured by the Pacific Electric Heating Company before the name was changed to the Hotpoint Electric Heating Company. He traveled over the United States and Canada as well as Mexico, securing new accounts for the Hotpoint company, which later was merged into the Edison Electric Appliance Company. In 1922 he was appointed district sales manager of the St. Louis district and one year later was transferred as sales manager of the Chicago district to Chicago.

Recent Court Decisions

Colorado Commission Must Not Raise Municipal Rates.—Citizens of Holyoke, Col., which operates a municipal electric light and power plant, refused to pay higher rates authorized by the Public Utilities Commission of Colorado and brought suit when the city tried to collect them. The plaintiffs have been sustained by the Supreme Court of the state, which says: "The assessment of rates for a municipally owned utility in a home-rule city or town is a municipal function, and every town of more than two thousand inhabitants can, by adopting a charter, free itself from any commission that might have the power to interfere with its conduct of purely local affairs. Human nature is such," the court saw fit to add, "that the management of corporations, unless restrained, will charge all the traffic will bear."

Valuation Fixed in 1921 Declared Invalid.—A decision which puts back the litigation and valuation proceedings to the original starting point in the action of the city of Superior to acquire and operate the electric light and gas plants of the Superior Water, Light & Power Company (see ELECTRICAL WORLD, November 24, 1923, page 1087) has been handed down by the United States District Court, which has denied the petition of the company for an injunction restraining the city and the Wisconsin Railroad Commission from continuing proceedings to acquire the plants in question. While the decision emphasizes the fact that the commission is not deprived of jurisdiction on account of the long delay in finally determining the value and fixing the terms of the purchase, another part of it rules that the order of July 11, 1921, issued by the commission to fix a valuation for the two plants is invalid. This valuation therefore cannot stand in future acquisition proceedings.

Person Who Approaches Live Wire with Knowledge of Danger Held Negligible.—A wire belonging to the Kansas City Light & Power Company broke during a thunderstorm and one end of it fell partly on a tree and partly on the sidewalk. One Morris, a passerby, got a broom and pushed the wire from the sidewalk, walked away a short distance to warn children of the danger and then returned to the near neighborhood of the broken wire, when, according to his testimony, it fell upon him from the tree, severely injuring him. In a suit brought by Morris against the company a jury verdict for $25,000 damages was reduced to $15,000 by the trial court. Subsequently the finding was reversed by the Supreme Court of Missouri, which held that one who with knowledge that the broken end of a live wire was hanging in the branch of a tree near the sidewalk unnecessarily approached within two feet thereof and was injured when the wire fell from the tree and struck him was contributorily negligent as a matter of law and could not recover in action for such injuries because, though defendant's negligence caused the dangerous situation, the plaintiff's negligence, and not defendant's negligence, was the proximate cause. (258 S. W. 431.)*

Commission Rate Orders Must Accord with Due Process of Law.—Asserting that the constitutional rights of a utility are not invaded by the pursuit of a wrong method of valuation and that in the absence of a method prescribed by statute the commission may proceed as it pleases, the Supreme Court of Wisconsin none the less reversed an order of the Wisconsin Railroad Commission reducing the gas rates charged at Chippewa Falls by the Wisconsin-Minnesota Light & Power Company, this reversal being the outcome of a suit brought by that company against the commission. The Supreme Court found that the rate which the commission sought to fix was confiscatory because it was not based on a finding that the existing rate was unreasonable or unjust and hence violated due process of law. The court emphasized the commission's nature as a fact-finding body not invested with discretionary powers. In a similar suit involving the Wisconsin-Minnesota's gas rates in Eau Claire the court declared that the Railroad Commission in setting aside existing rates cannot substitute its own estimates as to future revenues and operating costs for the experience of the managers of the company. (197 N. W. 359 and 363.)

Evidence that Guy Wire Was Without Strain Insulator Admissible in Action for Injury.—In Stone vs. City of Pleasanton the plaintiff, a boy thirteen years old, recovered a judgment for $19,000 for injuries received when he came in contact with a live electric wire operated by the defendant. Part of the electric light system consisted of a pole on which were strung several bare wires carrying 2,300 volts. To the top of the pole a guy wire had been attached and fastened to a nearby tree. The tree was cut down about four months before the plaintiff was injured, and the guy wire was left hanging from the top of the pole to the ground, where part of it lay in a coil at the foot of the pole. In some way the plaintiff came in contact with it. Declaring the damages excessive by $4,000, the Supreme Court of Kansas sustained the verdict in other respects. It held that a city cannot by negligently maintaining electric light wires in a dangerous condition deny to persons the right to use any portion of a street open for public travel; that a city owning and operating an electric lighting system within its limits is under obligation to use the highest degree of care, including insulated wires where necessary, and that the cost of insulated wire is no excuse for not using it. Evidence is competent, the court held, where it tends to show that a guy wire attached to a pole carrying high-voltage wires had no strain insulator in it. (223 Pac. 312.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Commission Rulings

End of Boom Renders Establishment of Rate Basis for Shelby, Mont., Impossible.—Complaint of the imposition of unreasonably high electric and gas rates in the town of Shelby, Mont., by the Great Northern Utilities Company brought from the Montana Public Service Commission the assertion that overdevelopment and top-heavy management based on a building boom that had passed made it "idle now to attempt to find a rate base for the electric service at Shelby." The very light load demanded by customers, the commission said, threatened the maintenance of service in that community at all. "There is no real relief in sight," the commission declared, and "the only condition which will bring relief is an increased use of electrical energy. Particularly every effort should be made to build up a power load and the company should itself submit rates for such a load which, while defraying the cost, should be made as attractive as possible. In this connection we express the hope that there will be no more installations of private generating plants at Shelby and that those now in use will be discarded." No evidence existed, the commission said, to indicate that such plants are less costly than connection with the defendant's plant.

Water Pumping for Domestic Supply Is Industrial Power. — In approving rates submitted by the California Oregon Power Company, the Public Service Commission of Oregon quoted as follows from an earlier decision made by it on rates for the same company: "An unfortunate fact often disclosed by close analysis of conditions surrounding a particular case is that rates designed to provide a fair rate of return on an investment honestly and fairly made will be too high to promote a free use of the utility product and consequently will have a tendency to defeat the primary purpose of the charges." Objection was made by a water-power company to an increase in industrial power rates on the ground that it would necessitate increased water rates in the territory affected. This water utility sought to make applicable to its use the rate applied to irrigation customers. In response the commission said: "Continuity of domestic water service is a primary essential, and this commission would not permit such a water utility to require no better standard for its pumping service than is ordinarily supplied to irrigation consumers. Power rates for irrigation purposes contemplate the use of plant capacity normally installed for use during the winter lighting peak at a time when it would otherwise be idle, and rates for such service are correspondingly reduced. In all other instances coming before this commission water pumping for domestic supply has been considered as industrial power, and it will be so considered in this case."

Manufacturing and Markets

Devoted to the Discussion of Business and Economic Problems of the Producer and Distributor, with Market Reports, Trade Activities, Foreign and Construction News

The High Cost of Cutting Prices

Bad Influence of Paring Down Price on Large Contracts—Tendency Now Is to Inaugurate a One-Price Policy—Plenty of Room for Improvement Still Evident

By an Engineer Who Purchases

THERE is interesting evidence that determined effort is being made by the larger electrical manufacturers to put a stop to the practice of shading prices on large bids. It is high time. For although for years prices have been reasonably well maintained on staple lines and no one would think of attempting to barter on a small run-of-business order placed with any reputable electrical manufacturer, it has been very different when it came to large contracts on equipment.

The eagerness of the manufacturer for business has blinded him to both the ethics and the sound economics of the situation. Salesmen and sales managers are human, and it has long been common practice in the electrical industry, where a large contract is being placed, for the purchaser to advise the high man that he would have to lower his price and for the competing manufacturers to cut and sometimes recut their prices until the winner was actually a loser because his profit was all gone.

For a good many years I was engaged in central-station operating, and my contact with electrical manufacturers was entirely on technical matters. My ideas as to price ethics in the electrical industry were well defined, and I considered it as beyond question that a one-price policy existed.

An Illusion Shattered

Imagine, therefore, my surprise when it became necessary for me to specify and purchase various electrical material. I found that the initial price, unless it was for some standard article which was considered more or less of a staple, was nearly always quite flexible and amenable to variation downward. This condition existed not only among manufacturers but also among the contractors and many sales agents.

Now, what effect did this have on me? I discovered that the work of the buyer was not over when he had sifted out the lowest bid that complied with specifications. For it was then up to me to reopen negotiations with the high bidder, and it was a very rare case indeed where some seller would not at least "meet the other fellow's price." Too often, I believe, this other fellow's price was only a mythical price conceived by the purchaser solely with the idea of obtaining the article at less than any submitted price, an act which he considered absolutely justified in view of its common practice, made possible solely by the action of the sellers themselves. It is only fair to say that this condition is not restricted to the electrical industry by any means, but this is no excuse for a variable price policy.

Effect on Purchaser

Now, what is the inevitable result of such a condition? The purchaser in most cases finds that he is able to buy any equipment that is offered at a price lower than the submitted price, and, further, that the seller is nearly always quite ready to shade his price in order to get the order. The purchaser argues, therefore, that the original price would have provided the seller with a profit entirely too large, and the seller by cutting his price acknowledges that he can build the apparatus on a profitable basis at the lower figure, because he certainly would not be willing to accept continually business on anything but a profitable basis.

But take a case where competition is unusually keen and submitted prices have been very carefully adjusted until they are as low as the article can profitably be manufactured for. Then the purchaser says to seller A that he "would like to give him the order, but——." The purchaser happens to be one whom A wishes to please and the order is a large one. The salesman goes into conference with his sales manager and in a short time is back to see the purchaser and offers him the equipment at a lower price. He obtains the order, manufactures and delivers the apparatus, and mentions incidentally that his company was unable to make a profit on the job.

Customer Loses Confidence

Does the engineer believe it? He does not, for the very reason that in too many instances a similar cut has been obtained on other large purchases, and he knows that the manufacturer is not in business to sell goods continuously on an unprofitable basis. Very often this manufacturer could have obtained the order at his submitted price if he had stood stiffly for it, because his bid was actually the lowest, his material was the one that was particularly desired, and he had everything in his favor for closing the order had he but taken a firm stand that this was his lowest and best price and that under no circumstances could he take the order on any other figure, eager as he was to obtain it.

If it were clearly established as standard practice in electrical industry to maintain a one-price policy, how different the conditions would be! The purchaser's statement that he could buy Smith's products at a lower price would fall like water on a duck's back. Competition would be much keener and price would be more staple.

There would be no danger of price inflation, because the moment a manufacturer sees that his profits are becoming larger than are justifiable, he immediately lowers the price of various products to put him in a better competitive position. There was a conspicuous example of this in the transformer field not long ago.

All this has been evident to thinking men for years, but the temptation to the salesman is strong and it has been exceedingly difficult for any manufacturer to resist the demands of the purchaser so long as so many companies continue the practice. Fortunately, the matter is receiving attention now in the most influential circles, and it is said that the chief executive of one of the largest of our electrical manufacturers is taking a decided stand in the matter and is developing a consistent policy of one-price maintenance throughout his organization no matter how large the order. This company is reported to have turned down over three million dollars' worth of business last year by refusing to meet the price persuasion of the purchaser. This is naturally having a tendency to tighten up price policy all along the line, not only among manufacturers but also among contractors. It is a healthy sign that things are working in the right direction.

The struggle will be long and hard. It will take time to eradicate the bad habits that have been induced by variable prices. But the ultimate results will justify all the sacrifices that may be necessary.

Is Radio Running Away with the Jobber?

Analysis of Sales Shows that Salesmen Are Neglecting Staple Electrical Lines Because Radio Is Easy to Sell

BY AN EASTERN JOBBER

ELECTRICAL supply jobbers are continually battling to maintain a proper balance between the volume of sales of their various lines. The bread and butter of the business is, of course, the staples that sell the year around in large quantity. It is upon these staples—wire, conduit, sockets, lamps and the rest—that the jobber must depend for stability and the support of his overhead expenses. In the main also these are the lines that the jobber salesmen like to sell. Orders come with regularity. The price difference is not apt to be great, and it is this regular old-line stuff that keeps his pot boiling. Likewise this is the essential wiring material that the industry needs to carry forward the work of wiring up the buildings of America. But, as I say, it is a struggle to keep the salesman—and the sales manager as well—from stampeding from time to time in their enthusiasm for some popular specialty, and neglecting the staple lines. It has happened in the case of appliances, when the jobbers of this country went wild over clothes washers and vacuum cleaners. It is happening again right now on radio.

FEWER ELECTRICAL SALES

I find on analyzing last year's business that in our house we showed a material falling off in the standard lines in certain territories, while the salesmen had secured orders for radio material to such an extent that the sum total of the business in their territories was in excess of their previous year's efforts. It is perfectly natural for men to take the line of least resistance, and if we were sure that the radio business in the future would be as profitable as it is at the present time, then we might consider switching from the electrical business to the radio business. But those who have given any thought to the question know that it is only a question of time when the making of sales of radio apparatus will be just as difficult as any other business because it will be surrounded by the same obstacles and competition as exists in connection with the standard lines.

Again, radio is essentially a seasonable line. It is only popular during the winter months, when atmospheric disturbances are at a minimum. We have found in this one year of our experience with the radio business that radio sales were at the peak at a time when the sale of electrical goods was at the minimum. Therefore, with the combination of the two, we should be able to even out the curve of general business throughout the year.

Of course, if the electrical business was to be neglected during the five months when radio material is easily sold, one would not be in so good a position to secure his full share of electrical business at the time it is at its peak. Then if the trend of the radio business is to be as I picture it—that is, if it will in the near future work down to a normal merchandising basis—the house which did not give the same attention to its electrical business as it had done theretofore would find itself going into decadence from the standpoint of the growth of the electrical business.

RADIO SHOULD BE AN ADJUNCT

As I view it, the radio business should be an adjunct and addition to the electrical business and not supplant it in any way. I believe the remedy is to create a separate radio department under independent management and segregated entirely from the other business, so that electrical salesmen would not sell radio material, which, of course, would mean that special radio salesmen would furnish the outlet for the radio department.

While the radio business at the present time seems easy and lucrative, as a jobber I view with grave concern the future in this line of business. There has been an unprecedented demand for this one line of material, and new concerns have sprung up like mushrooms, not only in a retail way but also as wholesalers or jobbers. Naturally, a very large percentage of those entering the field are not seasoned business men and are succeeding at the present time only because the demand cannot be supplied. When the condition is reached, which is sure to come, that it is a buyers' market instead of a sellers', by far the great majority of those now getting into the game will have to drop by the wayside.

Summing up the situation, I feel that the electrical jobber should keep his feet on the ground and, while profiting by the exigencies of the occasion, not forget that he owes his existence to the electrical business. He should realize that the electrical industry is still growing rapidly, and he should continue to grow with it.

To Discuss Manufacturers' Labor Problems

A NUMBER of important problems of the manufacturer are to have special consideration at the convention of the Chamber of Commerce of the United States to be held at Cleveland May 6-8. A special group meeting of leading manufacturers from all over the country will be held on the opening day of the convention, under the auspices of the chamber's department of manufacture, of which E. W. McCullough is manager. The preliminary program, which has just been announced, in-

cludes the following subjects: "The Obligations of Employer and Workers in Successful Production," "Industrial Pensions or the Care of Faithful Workers" and "The Simplification of the Government's Purchases."

A steady gain is being made in the recognition of the fact that the mental attitude of the worker toward his employer and his job determines very largely the output of a plant and is a greater factor than fine mechanical equipment. This general subject is to be given major prominence at the meeting. As to government purchasing, the Chamber of Commerce feels that the charge that "red-tape" methods and complicated specifications are an obstacle to government purchasing is being made untrue by the rapid disappearance of these methods. Interesting facts are to be presented on this situation.

Business Conditions

A Survey of Important Developments in the Electrical Market Including Data on Production, the Sales Outlook, Credits, Exports, the Metals and Other Conditions Affecting Cost, Supply and Demand

THE tendency of the electrical market this week has been toward improvement, and two points seem to stand out particularly in the situation: (1) Electrical manufacturers and jobbers are turning their attention very energetically toward the development of business in the residence and commercial fields to take the place of the reduced sales to the industrial market; (2) the shelves of jobbers, dealers and consumers are comparatively empty so that the large volume of current business is producing a very active demand.

Buying is from hand to mouth, but this purchasing is sufficiently heavy to make the general situation healthy. The opportunity for the development of a greater consumption of commodities which are purchased directly by the public is so apparent that it suggests an immediate substitute for the normal business of the industrial buyer. This has led to very active selling of domestic appliances and residence lighting as well as store and window lighting, another indirect approach to the popular purse. The central station continues the largest buyer in the market.

Line material has been selling heavily this week in New England with very active demand for appliances, and range orders are still prominent. In the New York district there has been a continued improvement, and the volume of business has increased nearly to the level of the early weeks of the year, with active selling of construction material. Building in the Southeast has increased and general business is good, but the lateness of the season has been slowing up the movement of farm-lighting equipment. In the Middle West weather conditions have had a bad influence, but business has been about the same as last week, with an active market for line materials and also for building supplies, particularly in Wisconsin and Kansas. A price competition on steel pipe has resulted in a 12 per cent saving to the consumer, which will probably be of short duration. The spread of the hoof-and-mouth disease has staggered the cattle industry in California and had a depressing effect on all business. Railroad and power company buying is sufficient, however, to maintain the electrical market at a fair level on the Pacific Coast.

Storage Batteries in Growing Demand for Various Purposes

THE demand for storage batteries is constantly growing; present sales are far ahead of any period in the past and a constant increase in requirements is anticipated. This increased market is attributed to various conditions. The elimination of small battery companies that sprang up during the war has no doubt materially increased the market for reliable national companies.

Wider use of electric vehicles is increasing consumption, the larger number of gasoline cars manufactured is contributing to the growing demand, and radio is using a considerable number of batteries. There is also a decided increase in the use of storage batteries in the mine field, for farm and house lighting, etc. At present the demand for storage batteries for automobiles has slackened somewhat, owing largely to anticipation of requirements by the automobile industry, but battery manufacturers believe that as soon as new cars start moving freely orders will increase, with a consequent pressure for early delivery.

Deliveries are good at the present time, both of raw material to the factory and as regards shipment of the finished product and repair parts. Shipments on batteries for electric vehicles are as prompt as usual in this line, where the battery must be assembled to fit the individual order after the order is received. The adoption of standards, work on which is now being done by the vehicle manufacturers, to reduce the number of assemblies will also improve deliveries. During the early part of the year several companies advanced prices because of a rapid increase in the market price of lead, while in some cases increases were considered more in the nature of adjustments. The lead market is apparently the only factor that would affect costs at the present time, but no price revisions are now contemplated and it is quite likely that firmness will prevail throughout the year.

Range and Heater Sales Growing Throughout the Country

MANUFACTURERS of domestic heating appliances from ranges downward are taking an optimistic view of 1924 business in this field, although the increase above last year's first quarter has not been up to expectations. Political conditions are unquestionably putting a damper on sales expansion, and manufacturers are virtually unanimous in their desire for constructive and economic legislation at Washington as a foundation for the logical development of trade which would normally be experienced this year.

In the electric range field greater co-operation between manufacturers, jobbers and central stations is beginning to bear fruit, and within the next few months retail sales are expected to show marked improvement. There is still plenty of slack to take up in range-manufacturing facilities, and no very extensive plant expansion is looked for during 1924. The Far West and some sections of the South are buying freely, and New England is showing new life in inquiries and orders as well.

There is very active interest in smaller outfits for electric cooking, and the sale to summer camps this year bids fair to run into large figures. The steady extension of central-station service into areas formerly deserted electrically, combined with vigorous demonstration and advertising work, are yielding excellent results. Hotel buying of larger ranges is very encouraging. Electric water heaters are slowly coming into popular favor, especially in the case of designs provided with predetermined cut-off features. Fireless cookers are gradually gaining headway. Prices are steady, raw material and labor are plentiful, and deliveries are in good shape, although it is uncertain how long the present prompt shipments can be made on some of the newer and more popular small units.

Germans Competing Strongly in South American Market

AT THE end of the war much speculation was heard as to the extent to which cheap German electrical products were going to disrupt the markets of the world. Perhaps as a result of the internal disturbances in Germany, this has not materialized, and the penetration of American markets has not been extensive. A recent statement in the *Electrical Times* of London, however, shows that German products are invading the South American markets with considerable effect. For instance, 50-cp. metal-filament, screw-socket Osram lamps are being offered at 7 cents gold each, c.i.f. A state power company, instead of buying 100,000 as at first intended, actually purchased double that quantity. A 10,000-kw. turbo-alternator for the same company was also ordered from Germany and a very good delivery was obtained.

In small electrical accessories the Germans, it is said, are quoting the most extraordinary prices. Standard-type flush switches, well made and finished, are offered at 15½ cents gold each; 9,000-volt porcelain insulators at 12½

cents each, 17,000-volt porcelain insulators at 29 cents each, 220-volt alternating-current 10-in. table fans with wire guard and flexible cord, excellently finished at $3.60 each, domestic irons, "Hotpoint" type, at $2.15 each with cord and plug. The Germans actually call these irons "Tipo Hotpoint." An excellent quality of ¾-in. gray-proofed insulating tape in rolls of 25 meters each are offered at 35 cents per pound; lamp sockets are 6¼ cents each; wall plugs, standard type with porcelain base and plug, at 6¼ cents each; push-type pear switches, excellently finished, at 7½ cents each, etc. It is further stated that large orders are being placed at similar prices for every sort of electrical goods.

The Metal Market

THERE has been little activity in the non-ferrous metal market this week owing to the Easter holidays and the closing of the London market on Friday, Saturday and Monday. Prices are practically stationary with the probable trend upward in copper and zinc and downward in lead and antimony.

NEW YORK METAL MARKET PRICES

	April 16, 1924 Cents per Pound	April 23, 1924 Cents per Pound
Copper, electrolytic	13.475	13¼
Lead, Am. S. & R. price	8¼	7.90–8.25
Antimony	9	9¼–10
Nickel, ingot	27	27
Zinc, spot	6.40	6¼
Tin, straits	49⅛	49¼
Aluminum, 98 to 99 per cent	27–28	28–29

Sales of copper have been not quite so good as last week, and although the price earlier in the week has been 13¼ cents, occasional later sales have been made at 13⅛ cents. Some large buyers were able to make purchases at 13⅛ cents, but at this price did not fill their requirements. Most of the business transacted in the past two weeks was from the electrical industry, including wire, telephone and telegraph companies.

Line Material Moving Actively in New England District

CURRENT trade in New England reflects the expansion of central-station service in all six states, the demand for line material being the most prominent market feature, with heavier appliances running a close second. Nothing can seem to slow down the growth of electric utility service, and the effect of the demand on manufacturer, jobber and dealer is to maintain a volume of trade of basic value despite the industrial ups and downs of a presidential year. Buying by northeastern industries, on the other hand is cautious, and jobbers' stocks are being kept close to present requirements; but deliveries are so good that electrical supplies of virtually all kinds are moving with extraordinary smoothness. Prices weakened within a few days on weatherproof wire owing to sharp competition, but in general quotations are holding firm. Washer, cleaner and range business shows improvement in response to increased sales effort, and industrial electric heating apparatus sales are quickening. Specialized instruments are making new records in their own market, the widening interest in central-station and industrial research accounting for a good deal of this business.

Echoes of the recent Boston electric range show are still heard in the shape of inquiries of and sales by retailers, who in some cases have had to hold back their exploitation work in order to meet the immediate needs of prospective customers secured in connection with the exhibition. The central-station syndicate appliance sales reports are gratifying for this time of year. A small but acceptable business is being handled in iron wire for municipal fire-alarm and signaling use, and radio batteries and supplies are in large demand, with no important shortages reported.

Gradual Improvement Noted in New York District

THERE is a general trend toward continuous improvement of business in the New York district. The unsettled political situation seems to be having less effect, and business has improved over March. Industrial buying, which started off so well the first of the year, is not active, and there is hesitation about making large commitments. Central-station business showed a slight falling off last week, and continues at the same pace, although in the aggregate contributing a large amount of business to the industry.

The volume of business done in supply lines is now in many cases equal to that of January, there being a decided upward turn from the low period in March. The slowing up in industrial building contracts now being let has caused no change in the demand for building supply lines, as yet, and one large producer states that he expects the excellent demand for conduit to continue throughout the year. Manufacturers are making fairly prompt deliveries on the great majority of supply lines, and jobbers' stocks are in good shape to meet all normal demands. Collections are reported fair to tight.

Improvement Shown in Southeast —Construction Active

THE past week of spring weather has caused some increase in retail business in the Southeast. Construction continues, with contracts awarded during March in the Carolinas, Georgia, Florida, Alabama, Mississippi, Tennessee, Arkansas and Louisiana amounting to $46,856,900, this being more than $6,000,000 in excess of February. One of the largest manufacturers reports the receipt of an order from the government for power-house equipment for Muscle Shoals amounting to over $1,250,000, the largest single order ever handled by a Southeastern district office. Two other orders, also reported by the same manufacturer, aggregate $500,000—the smaller one being from an industrial firm and the larger one from a central-station company and both being for power-house equipment.

The late spring has slowed up the movement of farm lighting equipment in Georgia and Alabama, though orders from Florida and North Carolina are very satisfactory. A scattering of orders for oil-engine generating equipment is reported from small municipalities in Florida and the Carolinas. The textile outlook shows little improvement, with many mills either shut down or operating part time. This curtailment is reflected in all retail lines in the textile centers. Jobbers report collections as satisfactory.

Active Utility Construction in Middle West

BUSINESS continues much the same this week as last in the Middle West, with possibly small decline. Jobbers are quoting on various commodities in considerable volume, but commitments are being withheld in most instances. This may be attributed to uncertainties arising from the political situation, but the general feeling in buying circles would indicate that the slowness of real spring weather is the cause of much delay. Construction work by the larger utilities is still progressing, and this has a tendency somewhat to stabilize conditions. The demand for poles and pole-line hardware is a little below normal, although good business has been booked in these particular lines to take care of the summer expansions of utility service. Reports from the Wisconsin and Kansas territories indicate that a major building program is being conducted, and the electrical trade throughout those districts is enjoying excellent business. Every indication is that a profitable summer is ahead.

Prices on most commodities are stable, except for a price war on steel pipe used by utilities and for underground work. This has brought a saving of about 12 per cent to the buyer, but it is not expected that this price will stay in effect long. Sales of cleaning devices have improved owing to spring renovating requirements.

Utility Companies Maintain Business on Pacific Coast

THE hoof-and-mouth cattle epidemic, originating probably from drought conditions, has appreciably slowed up California business, and its peak apparently has not yet been reached. The temporary collapse of contributing markets has naturally affected the business of electrical dealers and jobbers. The volume of construction by railroad and power companies, however, continues to maintain business at a fair level.

The railroads have purchased an aggregate of nearly a thousand miles of iron and copper wire during the last week and 3,500 poles, principally in 35-ft. and 40-ft. sizes, have been contracted for by the Great Western Power Company. There has been a strong demand for fiber conduit, with the result that stocks are very low and apparently replenishing supplies are not due to arrive for some time. Motors rated at 3 hp. and 5 hp., largely for irrigation purposes, are selling well, and there is a big demand for porcelain knobs assembled with nails. Although the manufacturing cost of rigid iron conduit has advanced, the selling price has not changed owing to keen competition. Collections are reported as slightly slower so far this month.

Activities of the Trade

Devoted to News of the
Manufacturer, Jobber, Agent, Contractor and Dealer, Including Important Orders and Contracts for Apparatus and Equipment

Chicago Fuse Manufacturing Reorganizes

The Chicago Fuse Manufacturing Company has announced a reorganization which includes the purchase by its president, W. W. Merrill, of the remaining block of stock held by A. D. Dana, New York, until recently chairman of the board, who has been inactive in the company's affairs for a number of years. The capital stock has been changed from 7,500 shares of $100 par value to 60,000 shares of no par value. Mr. Merrill and his associates now own the controlling stock of the corporation. There will be no change in its policies or methods, the active management of the company remaining the same as heretofore.

In making this latest move Mr. Merrill has taken his final step in his advancement from a minor employee in 1894 to president and controlling stockholder at the completion of thirty years of activities with the company. The Chicago Fuse Manufacturing Company started in 1889 with a paid-in capital of $25,000. It is worth at the present time over $1,250,000, with no funded debt, no bank loans and no other stock authorized.

General Electric Receives Order for 40,000-Kva. Turbo-Generators

The General Electric Company has recently received an order from the Columbia Power Company, Cincinnati, for two 40,000-kva. turbo-generators to be used in the new power station at the junction of the Ohio and Miami Rivers near Cincinnati. These units are tandem-compound, 85 per cent power factor, 13,200-volt, designed to operate at a pressure of 550 lb. gage, 725 deg. F. and 1 in. absolute back pressure. A 2,000-kw., 70 per cent power factor, 2,300-volt service generator is also included in the order. Provision is made in these turbines for reheating the steam and for steam extraction for feed-water heating.

American Engineering Company Reports Stoker Orders

Some of the recent orders received by the American Engineering Company, Philadelphia, for Taylor stokers are as follows: From the Philadelphia Electric Company, for the Chester station, seven fifteen-retort, double-crusher-roll stokers for boilers of 1,422 hp. and for the Delaware station, six of the same type. From the Columbus (Ohio) Railway, Power & Light Company, eight eleven-retort, thirty-seven tuyères deep, steam-operated ash discharge, for boilers of 1,470 hp. From the St. Maurice Paper Company, Ltd., Cape Madeleine, Quebec, three six-retort, steam-operated ash discharge, for boilers of 554 hp. From the Dayton (Ohio) Power & Light Company, for the Third Street heating plant, one fourteen-retort, steam-operated ash discharge. From the United Electric Light & Power Company, New York, for the Hell Gate station, three fourteen-retort, double-roll-crusher type. From the Illinois Power Company, De Kalb, Ill., one six-retort, double-roll-crusher type, for a 500-hp., boiler. From the Public Service Electric Company, Newark, N. J., for the Kearny station, six sixteen-retort, double-crusher type, for boilers of 2,360 hp. These stokers are single-set and thirty-seven tuyères deep and are the biggest ever built.

National Light & Electric Expanding Facilities

A piece of property with frontages of 61 ft. on Lafayette Street and 25 ft. on Mulberry Street, Newark, N. J., on which is a four-story brick building, has been purchased by the National Light & Electric Company, jobbers. This company is now at 289 Market Street. The new building will be occupied about May 1, after present alterations are completed. The company is selling exclusively at wholesale and plans to expand its electrical department materially. A large fixture and radio showroom will be provided on the ground floor. George Ollendorf is president and general manager, Harry Hirsch vice-president and treasurer and Max Hirschfield sales manager in the electrical department.

Associated Manufacturers Inaugurate Summer Radio Campaign

According to an announcement made by E. B. Mallory, chairman of the Radio Section of the Associated Manufacturers of Electrical Supplies, plans and programs just completed by the larger broadcasting stations in the United States, as well as by the leading manufacturers of radio apparatus, will make the summer of 1924 the greatest radio summer since broadcasting was begun. Extraordinary circumstances have combined, he declared, to create an exceptionally interesting situation this year, and a nation-wide survey shows that the industry is prepared to render a higher standard of service.

The broadcasting of interesting political and sporting events, the operation of more Class B high-powered broadcasting stations and striking improvements noted in the new receiving apparatus now on the market are assurance to the radio audience that reception during the hottest summer months will be vastly better. Preliminary reports from radio distributors and dealers, in Mr. Mallory's opinion, indicate the expectation of record-breaking summer sales of radio apparatus this year.

American Transformer Company Expanding Facilities

The American Transformer Company, 174-182 Emmet Street, Newark, N. J., has just purchased the adjoining property, 75 ft. x 100 ft., with a building thereon, which is well adapted for expanding the company's facilities for the manufacture of its products. This gives it an additional 10,000 sq.ft. of space and will relieve the pressure to which it was put last winter with not only an increase in its radio line, comprising the "Amer-Tran" audio-frequency transformers, but also in its general transformer business.

Hamilton-Beach to Make All Appliances at Racine

All of the electrical appliances made by the Scovill Manufacturing Company at Waterbury, Conn., during the past three years, bearing the name of the Hamilton-Beach Manufacturing Company, will now be manufactured in the Racine (Wis.) plant of the Hamilton-Beach company, according to an announcement made by T. B. Myers, vice-president and general manager of the company.

This change is the result of a study which has been in progress to concentrate manufacturing operations at a more advantageous point so that the practice of making the same products both in the East and in the West, with its needless duplication of effort, could be eliminated. An increase of about 200 men in the factory force and the building of new additions to accommodate the expected increase in business are contemplated for the immediate future.

Westinghouse Company Moves Into New Building

The executive offices of the Westinghouse Electric & Manufacturing Company have been moved from 165 Broadway, New York, to the new twenty-three-story Westinghouse Building at 150 Broadway. All departments of the company have been conducting their business in the new building since last Monday. The Westinghouse Electric International Company and the Westinghouse Lamp Company will move into the new building at the end of the week. The upper twelve floors of the building, having an area of 100,000 sq.ft., are occupied by the Westinghouse company.

General Electric Employees Subscribe to $5,339,800 Bonds

Employees of the General Electric Company are owners of, or are paying on the installment plan for, a total of $11,458,260 in General Electric employees' securities corporation bonds, according to an announcement made after a tabulation had been made of the subscriptions to the third offering of these bonds. These subscriptions amount to $5,339,800. The number of employees who have subscribed to these bonds, which pay 8 per cent as long as the individual remains with the company, is around 267,100.

Large Insulator Order Placed

The Washington Water Power Company, Spokane, Wash., has placed contracts for twelve carloads of porcelain insulators for high-tension lines. The Pacific States Electric Company, San Francisco; the Western Electric Company, New York, and the Ohio Brass Company, Mansfield, Ohio, will each supply four carloads.

Brandes Opens New Factory in England

The formal opening of the new factory of Brandes Limited in England was celebrated recently at a dinner held in the Engineers' Club of London, at which were present Frederick Dietrich, president of C. Brandes, Inc., and head of the English organization; C. E. Brigham, chief research engineer of the American Brandes interests; Managing Director Bartlett and other officials of the English company, and representative jobbers of the British Isles.

The new factory, which is at Slough, Buckinghamshire, is of sawtooth construction and contains about 30,000 sq.ft. of floor space. Announcement was made at the dinner that Brandes Limited will also soon inaugurate an aggressive advertising campaign to stimulate summer radio sales.

The Century Electric Company, St. Louis, announces the removal of its Chicago office from 56 West Randolph Street to 160 North La Salle Street.

The Magnovox Company, 2725 East Fourteenth Street, Oakland, Cal., manufacturer of radio apparatus, has awarded a general contract for the construction of a two-story addition to its plant, to cost about $50,000.

Thoner & Martens, 463 Commercial Street, Boston, are now placing on the market a portable test block with flexible cord and plug to facilitate the testing of commercial sizes of incandescent lamps from the mogul base downward.

The Bethlehem Shipbuilding Corporation, Ltd., Bethlehem, Pa., announces that the Iowa Electric Company has placed an order for a full set of equipment of the Bethlehem-Dahl fuel-oil-burning apparatus for its power station at Guthrie, Iowa.

The General Electric Company, through its Philadelphia office, has asked bids for the erection of another building at the local plant at Elmwood Avenue and Sixty-eight Street, to be known as Unit No. 8 and to cost in excess of $150,000.

The Westinghouse Electric & Manufacturing Company has awarded a contract for the erection of the second unit at its plant at Emeryville, near San Francisco, where a 12-acre site recently was acquired. The new buildings will cost approximately $500,000, with equipment. Work will be placed in progress at an early date.

The Burgess Battery Company, Madison, Wis., announces that it will erect a one-story factory addition estimated to cost approximately $100,000, which will provide sufficient manufacturing space for expansion purposes to take care of its rapidly increasing business. The new building will be at Brearly and East Main Streets opposite the present factory.

The McDowell Armature & Machine Works, Inc., Bluefield, W. Va., lately organized, has leased property at Welch, W. Va., and will install and operate a new electrical equipment and repair works for armatures, coil winding, etc. The company has purchased considerable equipment heretofore used by the Welch Armature Company and will place orders for other apparatus at an early date.

The Galvin Electric Manufacturing Company, 3320 South Broadway, St. Louis, has brought out a new 10-in. induction-type non-oscillating fan. A 10-ft. attachment card with Hubbell plug and Cutler-Hammer feed-through switch for start and stop is provided.

The Economy Fuse & Manufacturing Company, Chicago, announces the appointment of J. S. Messer, for four years salesman in the New York office, 30 Church Street, as district sales manager, to succeed F. L. Williamson. Mr. Williamson has accepted a position as general sales manager of the Taplet Company, Philadelphia, with offices at 71 Murray Street, New York.

The International General Electric Company has recently received an order through its representatives, the Mitsui Company of Japan, for twenty-three 2,000-kva. transformers for the Tokyo Electric Light Company. This is the second order placed by the Tokyo company covering this rating of transformer, the previous order having called for fifty-five similar units, which have already been shipped.

New Equipment Available

Short Descriptions of New Apparatus and Accessory Equipment of Interest to the Electrical Industry and Available from Manufacturers and Announcements of New Lines

Double-Pole Magnetic Switch

A double-pole, electrically operated, mechanically locking switch that also cuts off its own operating current has been developed by the Monitor Controller Company, Baltimore. It is called the "Triplock." The switch is operated by two coils, a closing coil and an opening coil.

Upon energizing the closing-coil circuit the switch closes and is locked by a lever attached to the armature, which is drawn back until it is inclined and drops beneath the roller on which it previously rested. When the lever drops, the closing-coil circuit is automatically opened at a carbon break attached to the lever. Energizing the opening-coil circuit causes a plunger to move upward and trip the lever which has been holding the switch in the closed position. As soon as this lever is released the spring on the armature causes the switch to open. As the left-hand pole of the switch forms part of the opening-coil circuit, this circuit is automatically opened by the opening of the switch. At the same time the opening of the switch causes the carbon break for the closing-coil circuit again to make contact, leaving the switch in a position to be closed at will. At the present time this switch is only built in the 30-amp. size, but larger capacities will be developed later.

Centrifugal Compressor

A new design of single-stage centrifugal compressor, whose outstanding features are strong construction, accessibility, improved pressure characteristics and higher efficiencies, has been developed by the General Electric Company. The new compressors are of two types—single and double inlet. They are available in capacities from 500 cu.ft. to 75,000 cu.ft. per minute at 0.75-lb. to 6-lb. pressure. Oil pumps are provided to furnish plenty of oil to the bearings; capped holes in the tops of bearing linings are eliminated, preventing the entry of dust into the lubricating system, and a heavy hinged cast-iron cover is provided on one side of the middle bearing bracket, which may be lifted to inspect the return flow of oil from the lubricating system.

The pulsation point of these machines occurs at very light loads, and the efficiency curves obtained are broad, thus showing an improvement over older types. The no-load power consumption of the new machine is between 60 per cent and 70 per cent of that required for machines of previous design.

Portable Arc Welder

A portable arc welder of the continuous-arc type, known as "Metweld," has been developed by the Welding Metals Manufacturing Company, Cleveland. The welder is inclosed in a substantial case and is intended for production and maintenance work. It is available in 110-volt and 220-volt sizes and has a range of from 50 amp. to 150 amp. in six steps of approximately 20 amp. The 110-volt unit weighs 165 lb. and the 220-volt unit weighs 190 lb.

Stair Tread.—An open-grating stair tread with the outer edge clearly defined has been developed by the Mitchell-Tappen Company, 15 John Street, New York. The outer edge has been emphasized by carrying the nosing or fascia bar down to double its depth and bending the lower half back longitudinally at an angle of 45 deg. The effect has been to produce the appearance of a solid line, the width of an opening, so as to sharply define the outer edge of each tread and therefore lessen the chance of a misstep.

"Telechron." — The "telechron," a synchronous-motor-driven clock, especially useful in operating rooms, has been developed by the Warren Clock Company, Ashland, Mass. The clock is provided with a large second hand that moves over the whole dial with a smooth, uniform motion, there being no click or noise.

New Trade Literature

AIR HEATERS.—The Majestic Electric Appliance Company, Inc., San Francisco, has issued a catalog describing its new line of heavy-duty air heaters.

ELECTRICAL SUPPLIES.—The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued two supplements to its 1923-24 catalog of electrical supplies. The first, supplement 1 to section 8-A of the catalog, covers the Westinghouse "Bi-Lux" refractor and the "Holophane" two-way and four-way refractors for overhead street lighting. The second, supplement 3 to section 8-B, describes the "Bi-Lux" refractor for ornamental street lighting. Both of these supplements show candlepower distribution charts for each of the refractors described.

INDUSTRIAL SWITCH. — The Palmer Electric & Manufacturing Company, 175 Fifth Street, Cambridge, Mass., is distributing a four-page leaflet covering its "HP" universal service and industrial switch.

FRACTIONAL-HORSEPOWER STARTER AND ARMATURE SPEED CONTROLLERS. — The Ward Leonard Electric Company, Mount Vernon, N. Y., is distributing bulletins Nos. 57 and 58, covering respectively its "Vitrohm" fractional-horsepower armature speed controllers and its fractional-horsepower starter with low-voltage protection for d.c. motors.

ELECTRIC FURNACES. — The Detroit Electric Furnace Company, First National Bank Building, Detroit, is distributing bulletin No. 41, which calls attention to the advantages and economies effected by the use of electric furnaces. It tells of its increasing value in brass melting and shows how complete control of analysis, color, texture and homogeneity of the alloy is secured through the electric furnace.

BOILERS.—The Heine Boiler Company, St. Louis, is distributing bulletin No. 54 describing the Heine "V" type boiler. It contains an outline of the method of manufacturing the boiler and gives illustrations showing various boiler installations and also the company's plants in St. Louis and in Phoenixville, Pa.

MOTORS AND ELECTROPLATING GENERATORS.—The Chandeysson Electric Company, Bingham Avenue and Missouri Pacific Railroad, St. Louis, is distributing four bulletins describing the "Chandeysson" squirrel-cage alternating-current motors, motor-generator sets, direct-current motors and electroplating generators and motor-generator sets.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number.

An agency is desired in Brussels, Belgium (No. 9,931), for electric automobile accessories, heating and lighting appliances and radio accessories.

Purchase and agency is desired in Rotterdam, Netherlands (No. 9,928), for electric motors up to 1 hp.

An agency is desired in Gothenburg, Sweden (No. 9,929) and (No. 9,930), for radio sets, loud speakers, batteries and other equipment.

Purchase and agency is desired in Dublin, Ireland (No. 9,932), for cabinet and open radio sets, two, three and four-tube.

Purchase is desired in Bombay, India (No. 9,909), for electric torches and accessories.

Purchase and agency is desired in Jaffa, Palestine (No. 9,914), for electricians' tools.

HIGH-TENSION TRANSMISSION SYSTEM FOR WESTERN BRITTANY.—The establishment of a high-tension electric transmission system is being brought about, *Commerce Reports* states, by connecting existing steam plants at Brest, St. Brieuc, Lorient, St. Nazaire and Rennes with the large hydro-electric plant now being built at Guerledan, near Pontivy. Connection with the proposed tidal plants at Aber-Wrach and Rance is also contemplated. Further details regarding the Guerledan plant, together with the name of the concessionaire, may be obtained from the Electrical Equipment Division of the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch offices by referring to file No. 125,319.

PROPOSED ELECTRIC PLANT FOR LYDENBURG, SOUTH AFRICA — Plans are being considered, *Commerce Report* states, for the construction of an electric plant, to cost about £16,456, for the town of Lydenburg, in the Transvaal, for which a loan has been voted. It is proposed to utilize a waterfall 7½ miles from the town.

New Incorporations

THE BYNUM (TEX.) POWER & LIGHT COMPANY has been incorporated by W. W. Burnett, J. M. White and others.

THE WASHINGTON POWER & LIGHT COMPANY, Marietta, Ohio, has been incorporated with a capital stock of $100,000 by Henry S. Newton, James H. Trissler, William Taylor and A. T. Williamson.

THE COOKS FALLS (N. Y.) ELECTRIC COMPANY has been incorporated with a capital stock of $25,000 to generate electricity for light, heat and power. The incorporators are George I. Treyz, A. Treyz and S. E. Smith, all of Cooks Falls.

THE GAULEY ELECTRIC COMPANY, Gauley Bridge, W. Va., has been incorporated by L. M. Kryder, O. E. Crandall and others.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

DAMARISCOTTA MILLS, ME. — The Central Maine Power Company plans to construct a 33,000-volt transmission line from Wiscasset and also plans to rebuild its power line from Dresden Mills to Wiscasset, increasing the voltage. The present 11,000-volt transmission line from Boothbay Harbor will also be rebuilt and the voltage increased.

RANGELEY, ME.—The installation of a new generating unit, consisting of a 156-hp. waterwheel and a 225-kva. generator, is contemplated by the Oquossoc Light & Power Company this year. The company may also extend its pole 12 miles. H. B. Amber is treasurer.

BOSTON, MASS.—Plans are under consideration for the installation of an improved street-lighting system on Centre and South Streets, Jamaica Plain.

BOSTON, MASS.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until May 6, for six motors, complete with controllers and spare parts. (Schedule 2096.)

BRAINTREE, MASS.—Preparations are being made by the Electric Light Department for the installation of one 2,500-kva. turbine with surface condenser and one 600-hp. boiler equipped with superheater, which is expected to be in operation this fall. F. B. Lawrence is manager.

CAMBRIDGE, MASS.—The Ford Motor Company, Highland Park, Detroit, plans to construct a power house at its proposed local assembling works, to cost about $500,000. Albert Kahn, Marquette Building, Detroit, is architect.

NORWICH, CONN.—The Eastern Connecticut Power Company is negotiating for the purchase of the municipal electric plant. If acquired, the plant will be used for a central station, and extensions will be made in transmission lines in this section.

Middle Atlantic States

BROOKLYN, N. Y.—Bids will be received by Brigadier-General Edward J. Wescott, the Adjutant-General, National Guard Headquarters, Room 829, Municipal Building, New York City, until May 1, for construction, heating, sanitary and electric work for the New York State arsenal, Brooklyn. Sullivan W. Jones, Capitol, Albany, is state architect.

BROOKLYN, N. Y.—Bids will be received by the Superintendent of School Buildings, Board of Education, Flatbush Avenue Extension and Concord Street, until May 8 for installing electric wiring and fittings in new Public School 201, Brooklyn; new Public Schools 33 and 116, Borough of Queens, and in the addition to the James Madison High School, Brooklyn.

BROOKLYN, N. Y.—Bids will be received by the Superintendent of School Buildings, Flatbush Avenue Extension and Concord Street, Brooklyn, until May 8 for heating and ventilating and electric generating apparatus in master's house, dormitory buildings, infirmary, power house, etc., for the Parental School, Borough of Queens.

CINCINNATUS, N. Y.—The Binghamton Light, Heat & Power Company is negotiating for the purchase of the system of the Cincinnatus Light & Power Company. The Binghamton company is to construct a transmission line from Marathon Township to Willett to connect the two systems.

ELMSFORD, N. Y.—The New Central Railroad Company has purchased a site in Elmsford on which it proposes to erect a power house for use in connection with the proposed electrification of the Putnam Division.

HERKIMER, N. Y.—The installation of an ornamental lighting system on Main Street, to cost from $25,000 to $30,000, is under consideration by the Board of Village Trustees.

ITHACA, N. Y.—The New State Gas & Electric Corporation has petitioned the Public Service Commission for permission to construct and operate electric distribution systems in the towns of Madison, Augusta, Sangerfield, North Norwich, Lexington, and Halcott under franchises already granted the company. These communities have been served by small companies recently taken over by the New York State corporation.

LIVINGSTON MANOR, N. Y.—The Livingston Manor Electric Company contemplates the erection of a 44,000-volt, three-phase transmission line to Liberty.

NEW YORK, N. Y.—Bids will be received by the Superintendent of School Buildings, Flatbush Avenue Extension and Concord Street, Brooklyn, until May 8 for installing electric equipment in the addition to Public School 36, in the Bronx.

WALWORTH, N. Y. — The Walworth Light & Power Company, recently organized, plans to supply electricity in Walworth. Energy to operate the local system will be obtained from the municipal plant at Macedon.

ASPINWALL, PA.—Bids will be received by the United States Veterans' Bureau, Room 791, Arlington Building, Washington, D. C., until May 20 for hospital construction at Aspinwall. Separate bids to be submitted on building construction, central heating including heating equipment for all buidings, water supply, electrical work, elevator, refrigerating plant, smokestack, etc.

BLOSSBURG, PA.—Extensions contemplated by the North Penn Power Company this year include the erection of 22,000-volt transmission lines from Mansfield to Troy, Tioga to Lawrenceville and Westfield to Elkland; also a 33,000-volt line from Columbia Cross Roads to Troy. Leslie Weiss is superintendent.

HARRISBURG, PA.—Bids will be received by Berkey H. Boyd, Secretary of Property and Supplies, State Capitol Building, until May 13, for a quantity of electrical supplies for the ensuing year. (Schedule I.)

HARRISBURG, PA. — The Harrisburg Light & Power Company has applied for permission to erect a transmission line in Lower Swatara Township.

PHILADELPHIA, PA.—Bids will be received by the Depot Quartermaster, United States Marine Corps, until April 30, for 50,000 ft. cotton-covered lamp cord. (Schedule 444.)

PHILADELPHIA, PA.—The Philadelphia Electric Company has filed plans for the construction of a power house at Green Lane and Main Street, to cost about $75,000. Plans have also been filed for a substation at Paschall and Sixty-fifth Streets, to cost about $70,000.

RIDGWAY, PA.—The Keystone Power Corporation has been granted permission to take over and merge seventeen electric light and power companies operating in different sections of Clinton, Elk and Center Counties. Extensions will be made to transmission lines.

WARREN, PA.—The Penn Public Service Corporation has taken over the properties of the Warren-Jamestown Street Railway Company. Extensions to the system are under consideration.

WEST CHESTER, PA.—The West Vincent Township Power Company and the East Nantmeal Township Power Company, recently organized, are reported to be plan-

ning the construction of transmission lines in their respective territories. C. A. McClure, Wayne, is treasurer of both companies.

BALTIMORE, MD.—The Department of Lamps and Lighting contemplates the installation of an improved lighting system on North Avenue from Gay to St. Paul Street and from McMechen to Monroe Street during the present year.

CHARLESTON, W. VA.—The Kentucky & West Virginia Power Company is said to be planning the erection of a transmission line (about 190 miles) in the Big Sandy Valley section via Logan to Charleston and vicinity.

GAULEY BRIDGE, W. VA.—The Gauley Power Company, lately organized, has applied to the Federal Power Commission for permission to construct a series of five hydro-electric power plants, two on the Gauley River and three on the Meadow River, near Gauley Bridge and Kanawha Falls.

ALEXANDRIA, VA. — The Alexandria Light & Power Company contemplates short line extensions and improvements to provide for increased demand for service.

WASHINGTON, D. C.—Bids will be received by the General Supply Committee, Treasury Department, until May 7, for incandescent electric lamps as required by the department from July 1, 1924 to June 30, 1925. (Class 15.)

WASHINGTON, D. C.—Bids will be received by the Chief Signal Officer United States Army, until May 6 for fifty wire testing cabinets and 10 voltmeters (Circular CP-71515-1); until April 29 for 600 aluminum alloy battery boxes (Proposal C. P. 17499-1), and until May 14 for radio transmitters in lots of 25, 50, 75 and 100 (Proposal C. P. 16827-1.)

North Central States

CHARLEVOIX, MICH.—The erection of two rural electric transmission lines is under consideration by the Municipal Electric Light and Waterworks Department. C. N. Bridge is superintendent.

HORTON, MICH.—Extensions and improvements contemplated by the New Era Electric Company during the year include the installation of a new oil engine and the erection of ten or fifteen street lamps.

WAYLAND, MICH.—The M. & W. Light & Power Company is building a 4½-mile transmission line to Moline and expects to erect 8 miles additional to Byron Center. Clarence L. Miller is secretary and manager.

CINCINNATI, OHIO.—Work has started on the new electric generating station at Miami Fort by the Union Gas & Electric Company. The initial installation will include two steam turbo-generators of 40,000 kw. each. Plans provide for four units, each of the same capacity, to be installed later.

CLEVELAND, OHIO.—The City Council has adopted an ordinance appropriating $72,160 for an ornamental lighting system on Hough, Superior, St. Clair, Lorain and Prospect Avenues.

CLEVELAND, OHIO.—Bids will be received at the office of the Commissioner of Purchases and Supplies, City Hall, until May 2, for steel smoke breechings for the Division of Light and Power.

LAKEWOOD, OHIO.—The City Council is considering plans for the installation of an ornamental lighting system on Detroit and Madison Avenues, to cost about $50,000.

ORWELL, OHIO.—Robert I. Gross, owner of the local electric plant, contemplates installing a new 60-kva. unit and changing primary voltage to 2,300.

JEFFERSONVILLE, IND. — The Interstate Public Service Company, Indianapolis, plans to erect a 66,000-volt steel-tower transmission line from Jeffersonville to Scottsburg, to connect with the line from the new hydro-electric plant under construction by the Kentucky Hydro-Electric Company on the Dix River; also a 66,000-volt transmission line from Connersville to College Corners near the Ohio State Line, to connect with the system of the Union Gas & Electric Company at that point.

NORTH VERNON, IND. — The Louisville (Ky.) Gas & Electric Company, is negotiating for the purchase of the municipal power plant and proposes to extend its transmission line here.

RICHMOND, IND.—The Interstate Public Service Company, Indianapolis, is negotiating for the purchase of the municipal power plant. The plant, if acquired, it is said, will be used for central station service. Transmission-line extensions will be made.

STEWARDSON, ILL.—The Prairie Electric Company plans to change its transmission line from single-phase to three-phase this year. Ralph Williams is manager.

FOND DU LAC, WIS.—The installation of a new steam turbine, etc., at its local plant, to cost about $15,000, is under consideration by the Eastern Wisconsin Electric Company.

JANESVILLE, WIS.—Improvements are contemplated by the Janesville Electric Company, including the installation of substation regulators in Janesville, to cost $6,500; raising the voltage of its transmission line to Orfordville, $7,600, and the installation of three 200-kva. transformers at its substation in Egerton, $2,800.

LA CROSSE, WIS.—The Wisconsin Railway, Light & Power Company contemplates extensions and improvements to its electric generating stations, distribution systems and street-railway and interurban lines, to cost about $360,000. Of this amount, $160,000, it is said, will be used for the purchase of new equipment.

MADISON, WIS.—Plans are under way by the Wisconsin River Power Company for the construction of a substation, to cost about $20,500, which will connect its lines with the system of the Wisconsin Utilities Company at Monroe. New transformer equipment will be installed on the Portage-Madison line, to cost about $5,000.

MINERAL POINT, WIS. — Extensions and improvements are contemplated by the Mineral Point Public Service Company, to cost about $36,650. The proposed work will include extension of its transmission lines to furnish power service to the industries in Cobb and the new mining centers near here, to cost about $5,000; new electrical equipment, $15,000, to serve the oxide plant of the Mineral Point Zinc Company; installation of a condenser for the steam generating plant, $7,000, and erection of a transmission line and substation to serve the North Survey mine, $2,500.

PORTAGE, WIS.—The Southern Wisconsin Power Company contemplates an expenditure of about $11,575 for new equipment for its generating and electric distribution system serving Milbourn and Portage.

NEW PRAGUE, MINN.—Improvements contemplated by the Municipal Electric Light and Water Works Department include the installation of a uniflow engine directly connected to a 200-kw. alternator with exciter, a new switchboard, and building a new distribution system (2,300/115/230 volts) and a new well. Joseph T. Rynda is superintendent.

SAUK CENTER, MINN.—As the contract with the St. Cloud Public Service Company for supplying electricity to operate the municipal electric system expires Dec. 31, the Electric Light Commissioners are considering the installation of a 150-hp. or 200-hp. Diesel-engine unit in the municipal plant to generate electricity for the local system. V. T. Conklin is secretary.

CEDAR RAPIDS, IOWA. — The City Council has rejected all bids for the installation of an ornamental lighting system in the Loop district and will ask for new bids at an early date. T. F. McCauley is engineer.

CAMPBELL, MO.—The Campbell Electric Light & Power Company contemplates the erection of a transmission line to St. Francis, Ark., and one to Gibson and Holcomb, Mo. Ben F. Eicholtz is owner.

HIGGINSVILLE, MO.—The Board of Water and Light Commissioners contemplates the installation of a 200 hp. or 300-hp. generating unit, rewiring and rebuilding the residence section of the distribution system. O. L. Hebbler is superintendent.

TROY, MO.—The East Missouri Power Company contemplates extending its transmission lines to other towns during the year. L. A. Nickell is manager.

DEMPSTER, S. D.—The Dempster Electric Company contemplates connecting up with the system of the Union Public Service Company, St. Paul, Minn., during the coming summer. John J. Ludwig is manager.

FAIRBURY, NEB.—The Council has rejected bids received for the proposed addition to the municipal electric plant and plans to call for new bids at an early date.

KEARNEY, NEB.—Bids will be received by Mrs. M. E. Burke, city clerk, until May 7, for two 300-hp. oil-engine-driven generating units, with switchboard and transformer, and three horizontal motor-driven pumps, to be used in connection with waterworks improvement. The Burns & McDonnell Engineering Company, Interstate Building, Kansas City, Mo., are engineers.

O'NEILL, NEB.—The Board of Education is reported to be planning the construction of a central power plant for school service, to cost about $75,000.

BURLINGTON, KAN.—The Burlington Light, Power & Manufacturing Company plans to install an additional 200-hp. oil-engine-driven unit. G. H. Weibe is manager.

BURLINGTON, KAN. — The Excelsior Milling & Power Company has decided to discontinue the milling of flour and as soon as possible to increase the capacity of its power plant.

Southern States

AIKEN, S. C.—The Carolina Light & Power Company has acquired the Croft mill site, on which it proposes to build a hydro-electric plant, to cost about $200,000.

ATLANTA, GA.—The Georgia Railway & Power Company plans to build a power dam at Yonah Falls in connection with a hydro-electric development, to cost about $450,000.

HOLLYWOOD, FLA.—The installation of a 750-hp. Diesel engine is contemplated by the Hollywood Electric Light & Power Company.

JASPER, FLA. — The City Operating Company is practically rebuilding all its transmission and distributing lines and will install from thirty to forty electric meters. A. Worley is purchasing agent.

SEBRING, FLA.—Extensions and improvements contemplated by the Municipal Light and Water Department this year includes the installation of a new 300-hp. unit, extension of the light and water system into several new subdivisions, changing the street-lighting system from multi to series lamps and the rebuilding of the water system. H. P. Ballou is manager.

KNOXVILLE, TENN. — The Knoxville Power & Light Company is said to be arranging a fund of $500,000, for extensions and improvements during the present year.

BIRMINGHAM, ALA. — The Alabama Power Company has petitioned the Public Service Commission for permission to issue $5,000,000 in bonds, part of the proceeds to be used for acquiring or constructing new plants, improvements and extensions to its present properties, etc.

FOLEY, ALA.—The Foley Light & Power Company will soon start work on the extension of its line to the north end of Foley, covering about 1½ miles. E. A. Smith is manager.

CONWAY, ARK.—The light and water committee has purchased property for proposed extensions in the municipal electric plant, to cost about $50,000.

CAMPBELL, TEX.—Bonds have been authorized for the construction of a transmission line to Greenville for municipal service at Campbell.

JACKSONVILLE, TEX.—The Jacksonville Electric & Ice Company contemplates the erection of a transmission line from Jacksonville to Rusk and from Jacksonville to Troup, the installation of a large Heine boiler and surface condenser at its plant in Jacksonville, and building ice plants at Rusk and Troup. Jacob M. Irvine is chief engineer.

LONE OAK, TEX.—The Lone Oak Electric Light & Power Company contemplates installing a small generating unit and a street-lighting system in the near future. W. J. Simpson is manager.

RICHLAND, TEX. — R. F. Sikes and C. A. Gilley contemplate installing an electric plant in Richland.

Pacific and Mountain States

CENTRALIA, WASH. — Improvements involving an expenditure of about $150,000 are under way by the North Coast Power Company, which include doubling the voltage of the high-tension line between Tenino and the hydro-electric plant on the Kalama River, new substations at Tenino and Buccoda, new high-tension switching station at the Chehalis steam power plant and new substations at Napavine, Winlock, Vader, and Kalama.

TROUT LAKE, WASH.—Application has been filed with the Supervisor of Hydraulics by the Trout Lake Power & Light Company for permission to appropriate 350 second-feet of water from White Salmon River in Klickitat County. The plans provide for a development of 300 hp.

BEND, ORE.—Surveys, it is reported, are being made by the Pringle Falls Power & Water Company for a hydro-electric plant on the Deschutes River, with initial capacity of 6,700 hp.

OAKRIDGE, ORE.—Jesse A. Neal, has applied for permission to install a commercial electric system in Oakridge.

PORTLAND, ORE.—Extensions and improvements involving an expenditure of more than $1,000,000 for its local plant during the next twelve months are contemplated by the Northwestern Electric Company. New distributing lines will be erected into city districts not now served by the company, and substations are planned for both the East and West sides, for which tentative sites have been selected. Two new boilers aggregating 2,000 hp. will probably be added to the Lincoln Street station.

TILLAMOOK, ORE.—The Coast Power Company will soon begin work on rebuilding its present line from Garibaldi to Nehalem. About 3½ miles were built last year, and the remaining 6½ miles will be erected this year.

BAKERSFIELD, CAL.—Plans are being prepared for the installation of an ornamental lighting system on Sonora Street, using single-light standards with 250-cp. lamps; also, for a similar system on H Street, using 400-cp. lamps. W. D. Clarke is City Engineer.

LOS ANGELES, CAL.—Ordinances have been approved by the City Council authorizing the installation of 177 ornamental lamp posts on South Park Avenue, 156 on Vermont Avenue, 157 on Whittier Boulevard, and also on portions of Cahuenga Avenue, Buckingham Road and North Broadway.

PRINCETON, CAL.—The Pacific Gas & Electric Company plans to build a local substation, to be known as the Rice substation, to cost about $40,000 and to rebuild the transmission line from Hamilton to Colusa, at a cost of about $58,500.

RIVERSIDE, CAL.—The Southern Sierras Power Company plans to start soon on the construction of a hydro-electric power plant on Levining Creek. An electric generator and auxiliary apparatus will be installed at its power plant at Blythe.

SALINAS, CAL. — Extensions contemplated this year by the Coast Valleys Gas & Electric Company include the erection of a duplicate 22,000-volt transmission line from Salinas to Monterey, building a distribution substation at Moro Cojo and installation of voltage regulators at all substations. J. F. Pollard is vice-president.

SAN FRANCISCO, CAL. — The Great Western Power Company contemplates extensions and improvements, including the installation of a 30,000-kva. synchronous condenser and transformer bank at El Cerrito, to cost $700,000; additional equipment in the substations at Clayton and Antioch, to cost about $200,000, and transmission line extensions in the vicinity of Napa, Petaluma and Santa Rosa.

TURLOCK, CAL.—The Turlock Irrigation District contemplates the construction of a 4,000-kw. hydro-electric plant at the La Grange dam, to cost about $100,000.

HARDIN, MONT.—Bonds to the amount of $25,000 have been voted for the purchase of the plant of the Hardin Light & Power Company, thereby insuring the entrance of the lines of the Montana Power Company into Hardin and the erection of a high-tension transmission line to the Castle Rock coal fields.

NASHUA, MONT.—Plans are being considered for the installation of a municipal electric light and power system.

MONTE VISTA, COLO.—The American Beet Sugar Company, 32 Nassau Street, New York, is reported to be considering the construction of a mill here with power plant, to cost about $500,000.

Canada

PRINCE RUPERT, B. C.—The Skeena Laminated Wood Company, Ltd., Rogers Building, Vancouver, contemplates the installation of a power house at its proposed local plant, to cost about $200,000.

VANCOUVER, B. C.—Tenders will be received by the British Columbia Electric Railway Company, Ltd., until May 5 for the construction of a tunnel (3,400 ft. long) between Alouette Lake and Stave Lake in connection with the Alouette Lake power development. The cost is estimated at $360,000. E. E. Carpenter is consulting engineer.

WINNIPEG, MAN.—Tenders will be received by the chairman of committee on public utilities at the office of C. J. Brown, city clerk, until April 28 for furnishing the following apparatus for the municipal hydro-electric system: (1) Electric steam boilers; (2) oil circuit breakers, disconnecting switches and lightning arresters; (3) step-down single-phase transformers.

Electrical Patents

Announced by U. S. Patent Office

(Issued April 1, 1924)

1,488,847. TELEPHONE SYSTEM; J. F. Toomey, New York, N. Y. App. filed Dec. 17, 1920. Systems in which trunk lines are employed for connecting different switchboards.

1,488,873. WINDING; C. W. Francis, Paterson, N. J. App. filed Feb. 3, 1920. For field coils of multipolar machines.

1,488,876. ALTERNATING-CURRENT MOTOR; A. M. Hambright, Paterson, N. J. App. filed May 4, 1920. Winding assembly using semi-closed slots.

1,488,879. WIRE SPREADER; W. F. Hester, Tascosa, Tex. App. filed July 31, 1922. For preventing parallel electric wires from making contact.

1,488,908. DRY CELL; H. de Olaneta, New Haven, Conn. App. filed Aug. 18, 1920.

1,488,919. HIGH-VOLTAGE BUSHING; A. B. Hendricks, Jr., Pittsfield, Mass. App. filed Jan. 2, 1919.

1,488,934. MOTOR CONTROLLER; N. L. Mortensen, Milwaukee, Wis. App. filed June 21, 1917. Reversing controller having electro-responsive accelerating or speed-regulating switches provided with shunt windings.

1,488,936. HIGH-POTENTIAL ELECTRICITY ARRESTER ELECTRODE; F. R. Parker, Chicago, Ill. App. filed May 8, 1916.

1,488,948. BINDING POST; O. A. Smith, East Cleveland, Ohio. App. filed Dec. 14, 1921. For battery cells.

1,488,975. MAGNETO; P. Brown, Springfield, Mass. App. filed April 25, 1921. Reciprocating armature type.

1,489,002. DYNAMO-ELECTRIC MACHINE; C. A. Parsons and J. Rosen, Newcastle-on-Tyne, England. App. filed March 26, 1923. Having rotating fields provided with metal damping bars.

1,489,031. RADIODYNAMIC SYSTEM AND METHOD FOR AVOIDING WAVE INTERFERFERENCE; J. H. Hammond, Jr., Gloucester, Mass. App. filed March 25, 1914.

1,489,082. TELEPHONE EXCHANGE; F. A. Lundquist, Chicago, Ill. App. filed Sept. 30, 1918. Automatic exchanges.

1,489,087. ELECTRIC SWITCH; E. W. McKinley, New York, N. Y. App. filed June 20, 1923. In connection with electric vehicle signals.

1,489,093. WELDING ALUMINUM; R. D. Mershon, New York, N. Y. App. filed Dec. 8, 1919.

1,489,099. MANUFACTURE AND PRODUCTION OF GAS-TIGHT SEALS OF CLOSURES BETWEEN METAL AND VITREOUS MATERIAL; F. Reynolds, Walkerville-on-Tyne, England. App. filed June 5, 1922.

1,489,121. METALLURGICAL PROCESS; W. E. Greenawalt, Denver, Col. App. filed May 10, 1920. For extraction of copper from its ores by solvent processes.

1,489,127. ELECTRICAL TESTING SET; M. Kammerhoff, Orange, N. J. App. filed July 16, 1920. Portable; for testing electrical circuits, as in automobiles.

1,489,158. ARRANGEMENT FOR THE AUDIBLE RECEIVING OF UNDAMPED OSCILLATIONS; W. Schaffer, Berlin, Germany. App. filed Aug. 18, 1922.

1,489,175. COVER FOR ELECTRICAL OUTLET BOXES; B. A. Vandy, Rochester, N. Y. App. filed June 14, 1921.

1,489,182. UTENSIL; E. D. Weinberg, New York, N. Y. App. filed July 15, 1922. Motor-driven utensil used as a beater or whipper.

1,489,228. METHOD AND MEANS FOR NEUTRALIZING CAPACITY COUPLING IN AUDIONS; L. A. Hazeltine, Hoboken, N. J. App. filed Dec. 28, 1920.

(Issued April 8, 1924)

15,811 (reissue). ADAPTER; F. E. Baird, Blue Island, Ill. App. filed Jan. 13, 1921. For portable electric lanterns.

1,489,240. VOLTAIC BATTERY AND THE PRODUCTION OF ELECTRODE ELEMENTS THEREFOR; T. A. Edison, Llewellyn Park, Orange, N. J. App. filed Jan. 5, 1921.

1,489,260. MEANS FOR MOUNTING CIGAR LIGHTERS, ETC.; G. B. Lynch, New York, N. Y. App. filed Nov. 18, 1922.

1,489,273. SOCKET AND SHADE HOLDER RING; W. M. Parker, Parkersburg, W. Va. App. filed July 1, 1921. Utilizing molded insulating material.

1,489,276. MAGNETO GENETATOR; A. R. Railing and A. E. Angold, London, England. App. filed July 31, 1920. Hand-operated to furnish current to lamp or other device.

1,489,283. ADAPTER FOR ELECTRIC SOCKETS; H. C. Smyth, Jr., and E. H. Molson, New York, N. Y. App. filed Sept. 8, 1922. For wireless telephone sets.

1,489,284. ALTERNATING-CURRENT LIFTING MAGNET; J. F. Steininger, Chicago, Ill. App. filed June 18, 1923.

1,489,287. RECEIVER OF HIGH-FREQUENCY ELECTRICAL SIGNALS; A. H. Taylor, Washington, D. C. App. filed May 29, 1923. Reception of a multiplicity of high-frequency signals employing same antenna.

1,489,303. TRANSFORMER; R. V. Bingay, Pittsburgh, Pa. App. filed Aug. 11, 1920. Oil-insulated, shell-type core.

1,489,305. COMBINATION CLUB AND SEARCHLIGHT; W. S. Walkins, Racine, Wis. App. filed Feb. 9, 1923. For use by night watchmen.

1,489,313. PLUNGER CONSTRUCTION FOR SOLENOID HAMMERS; F. W. Davey, Brooklyn, N. Y. App. filed Jan. 5, 1921. Reciprocating type.

1,489,328. PRIMARY-BATTERY DEPOLARIZER; M. L. Martus, Woodbury, Conn. App. filed Dec. 12, 1921.

1,489,360. PROCESS OF MANUFACTURING IRON AND STEEL DIRECT FROM THE ORE; A. J. Moxham, Odessa, Del. App. filed June 7, 1919. Treated in an open-hearth or electric furnace for the manufacture of steel or other ferro-alloy.

1,489,369. INSULATOR; L. Steinberger, Brooklyn, N. Y. App. filed June 12, 1919. For use with lightning arresters or transformers.

1,489,370. INSULATOR; L. Steinberger, Brooklyn, N. Y. App. filed July 23, 1919. For use with lightning arresters, transformers or other electrical apparatus.

1,489,371. INSULATED SUPPORT FOR ELECTRICAL CONDUCTORS; L. Steinberger, Brooklyn, N. Y. App. filed May 28, 1920. For high-frequency inductance coils.

1,489,382. MAGNETO; P. Brown and H. H. Clark, Springfield, Mass. App. filed June 25, 1921. Reciprocating armature type.

1,489,402. ELECTRICAL CONDUCTOR CABLE; T. Varney, Sewickley, Pa. App. filed July 2, 1920. High-voltage flexible cable.

1,489,425. APPARATUS FOR NEUTRALIZING STATIC ELECTRICITY; W. H. Chapman, Portland, Me. App. filed April 5, 1920. In paper, wool, etc.

1,489,431. FLASHLIGHT; C. A. Drouillat, Brooklyn, N. Y. App. filed March 3, 1922. With combined hand-operated generating device.

1,489,461. LIGHTING-FIXTURE SUPPORT; B. Schaefer, Jamaica, N. Y. App. filed Dec. 18, 1920.

1,489,493. MOTOR REVERSE CONTROL; E. F. Gwynn and H. H. James, Pittsburgh, Pa. App. filed May 12, 1921. With motor running in one direction and controller reversed current is not applied in reversed direction until motor stops.

1,489,517. PROTECTIVE SYSTEM FOR ELECTRIC CONDUCTORS; R. W. Biles, Balcombe, England. App. filed March 27, 1923. For systems of the Merz-Price type.

1,489,518. DYNAMO REGULATOR; W. L. Bliss, Niagara Falls, N. Y. App. filed April 29, 1912. Automatic regulators used in car-lighting systems.

1,489,559, 1,4489,560. OVERLOAD SWITCH FOR MOTORS; F. Tobien, Essen, Germany. App. filed Dec. 29, 1921. For motor started by means of a starting resistance.

1,489,578. TELEPHONOGRAPH AND LIKE INSTRUMENT; R. Hase, Hanover, Germany. App. filed July 30, 1921. Wherein two cylinders are employed, one being automatically brought into action on the completion of the record upon the other.

1,489,640. JOINT BETWEEN PIPES AND FLANGES; G. T. Jacocks, West Hartford, Conn. App. filed Feb. 18, 1922. Process for electrically welding.

1,489,653. VARIOCOUPLER; A. E. Alger, Lorain, Ohio. App. filed Aug. 16, 1922 Employed in wireless telephony.

1,489,665. CURRENT-INDICATING DEVICE; W. J. Foster, W. W. Scherer and J. Schmid, Oakland, Cal. App. filed Jan. 26, 1923. Current transformers.

1,489,690. INSULATOR; A. O. Austin, Berberton, Ohio. App. filed Aug. 2, 1919. Using metal cap cemented to porcelain body.

1,489,719. ELECTRIC HEATER; M. W. Swanson, Chicago, Ill. App. filed Aug. 18, 1921. Strip type.

1,489,724. METHOD OF PRODUCING CHEMICAL REACTIONS; G. L. Wendt, Davenport, Iowa. App. filed April 28, 1922. By passing hydrogen through a silent electric discharge and bringing it into contact with a reacting material.

1,489,743. ELECTROLYTIC TERMINAL; G. Delius and C. P. Tatro, Seattle, Wash. App. filed Mrch 29, 1921. For use in the electrolysis of chlorine.

1,489,798. PROTECTING PILING FROM TEREDOS AND THE LIKE; C. P. Tatro and G. Delius, Seattle, Wash. App. filed March 21, 1921. Piling in seawater protected from wood borers.